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GAS LIGHT JOURNAL

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☞ ☞ Mr. Fred. Persons, who has charge of the arrangements under which the members of the American Association who propose to attend the New York convention will come on by special car from Chicago, Ills., desires us to say that he can be communicated with in regard to the trip at his Chicago address, No. 75 North Clinton street. It is desirable that word be sent him at as early a date as possible.

[OFFICIAL NOTICE.]

NEW YORK MEETING—CHANGES IN HEADQUARTERS.

In the circular issued from this office September 28th, the announcement was made that the headquarters during the coming meeting would be at the Holland House. The Committee has been notified by Mr. Kinsley, the proprietor, that owing to the failure on the part of the contractors to live up to their promises, it will be impossible for him to receive the Association at the time set for the meeting. The Committee has, therefore, been obliged to make other arrangements. The Gilsey House, Broadway, corner 29th street, has been selected for the headquarters. This hotel, like the Holland, is run on the European plan, and the rate for *rooms* will be $2 per day, and upwards, according to their character.

The Committee has made special arrangements with the Sturtevant House, for the accommodation of such of the members as prefer a hotel run on the American plan. This house is also corner of Broadway and 29th street, just across 29th street, from the Gilsey. The Sturtevant House makes a special uniform rate of $3.50 per day, covering room and meals, with the express understanding that rooms shall be engaged by the members *in advance*. These hotels agree to take care of all who apply in advance for accommodations. It will be well for the members to engage their rooms *at once*. Those members who have written to the Holland House for accommodations have already been booked for accommodations at the Gilsey. ALEX. C. HUMPHREYS, Acting Sec.

Drexel Building, Philadelphia, Pa., Oct. 7, 1891.

[OFFICIAL NOTICE.]

Nineteenth Annual Meeting of the American Gas Light Association.

EXTRACT FROM THE CONSTITUTION.—"SEC. 12. *Application for Active Membership, or for Associate Membership, or for transfer from Associate to Active Membership, must be received by the Secretary at least ten days prior to the meeting at which the application is acted on.*"

The nineteenth annual meeting of the American Gas Light Association will be held in New York, on October 21, 22 and 23. The headquarters will be at the Gilsey House, Broadway and 29th street.

The members will be called to order on the morning of Wednesday, October 21st, at 10 o'clock, by the President, John P. Harbison, Esq.

The following papers are promised :

1. "Leakage," by C. H. Nettleton, Birmingham, Conn.
2. "Meter Rent, a Question of Policy," by Walton Clark, Philadelphia, Pa.
3. "The Illuminating Power of Mixture of Coal and Water Gases," by Dr. E. G. Love, New York.
4. "Theoretical Effect of Preheating Blast, Steam and Oil in Water Gas Manufacture," by Rollin Norris, Philadelphia, Pa.
5. "Lime," by Dr. A. W. Wilkinson, New York.
6. "Intensity of Light," by A. B. Slater, Jr., Providence, R. I.
7. "Manipulation of Tar from Carbureted Water Gas," by David Douglas, Savannah, Ga.

It would seem that there may be a little more than the usual amount of time to devote to the discussion of material collected in the "Question-Box." Members will please send in to the Acting Secretary, in advance, any questions they wish to submit to the meeting, through this channel. The statement of recent personal experiences and difficulties might offer good material for this purpose, and might lead to valuable discussions.

The meetings of the Association will be held in Scottish Rite Hall, corner 29th street and Madison Avenue.

The attention of members is called to the bulletin board, which will be placed in rotunda of Gilsey House. Notices in regard to the meeting, and especially changes in and additions to the printed programme will be posted thereon, and it will, therefore, be well for the members to consult it from time to time.

As much valuable time is usually lost in calling the roll, and as but

an inaccurate list is thus obtained of the members present, it is proposed this year to follow the method inaugurated at the Savannah meeting, by having the members hand in their names to an attendant as they enter the meeting room for the first time. A special blank card has been adopted for this purpose, and these cards with pencils will be handed to members outside the Hall door. Members will please write thereon their names and addresses.

The Committee of Arrangements is providing for the entertainment of the members during the time that they are not occupied with the business, which is the prime object of the meeting. The pleasure of the ladies will, as usual, be carefully provided for. No full programme has yet been furnished the Acting Secretary, but he is able to announce a banquet to be tendered the members by the local Gas Companies, on the evening of Thursday, the 22d, at the new and palatial club house of the Manhattan Athletic Club, and a river excursion for the members and the ladies on Friday, the 23d. An informal hop for one of the evenings has also been under consideration.

Members wishing to provide for comfortable hotel accommodations, should remember that New York is full of visitors at the time selected for this meeting, and, therefore, they should engage rooms well in advance. The Gilsey House has given a special rate of $2.00 per day, and upwards, according to the character of the room. This is for rooms only, the hotel being conducted on the European plan. The Gilsey House may not be able to accommodate all the members, and, therefore, for the information of those not familiar with New York, the following hotels, all fairly convenient to the headquarters, are mentioned: Sturtevant, Coleman, Ashland, Grand, Grand Union, Bartholdi, Westminster, Brunswick, Hoffman, St. James, Fifth Avenue. There are many others within convenient distance. The Committee announces that a special rate has been given by the Sturtevant House. The regular rates of the other hotels vary, and some of the members may prefer to correspond with a number of these houses before selecting. Each of the houses named will afford thoroughly comfortable accommodations.

To lessen the chance of confusion, the question of transportation is dealt with in a separate circular, enclosed.

The Acting Secretary is instructed by the Council to call the especial attention of members whom it may concern, to Sec. 51 of Constitution, printed below.

"SEC. 51. *No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.*"

This provision of the Constitution will be enforced at the coming meeting.

The Acting Secretary also respectfully calls to the attention of those whom it may concern, part of Sec. 52, which reads:

"Any members whose dues shall remain unpaid for a term of 3 years, may be dropped from the roll of membership by a vote of the Council."

The Acting Secretary is sorry to find that unless the payments received between now and the time of meeting render it unnecessary, he will be obliged to report to the Council a number of names that he feels sure are only on this list through inadvertence on the part of the members.

Dues are payable in advance. If not already attended to, will the members please remit for their dues, before laying this circular aside?

Transportation.

The following Passenger Associations have granted the usual concession in railroad rates, namely: The Trunk Line Association, composed of the following railroads: Addison & Pennsylvania; Allegheny Valley; Baltimore & Ohio (Parkersburg, Bellaire and Wheeling, and east thereof); Baltimore & Potomac; *Bennington & Rutland; Buffalo, Rochester & Pittsburg; Camden & Atlantic; Central of New Jersey (except locally between Philadelphia and New York); *Central Vermont; Chesapeake & Ohio (east of Charleston, W. Va.); Cumberland Valley; Delaware & Hudson Canal Co.; Delaware, Lackawanna & Western; Elmira, Cortland & Northern; Fall Brook Coal Co.; *Fitchburg; *Grand Trunk; Lehigh Valley; N. Y. Central & Hudson River; N. Y., Lake Erie & Western (east of Salamanca and Buffalo); N. Y., Ontario & Western; N. Y., Philadelphia & Norfolk; Northern Central; Pennsylvania (except locally between Philadelphia and New York); Philadelphia & Erie; Philadelphia & Reading (except locally between Philadelphia and New York); Philadelphia, Wilmington & Baltimore; Rome, Watertown & Ogdensburg (except on Phœnix Line—between Syracuse and Oswego); Western N. Y. & Pennsylvania; West Jersey; West Shore; Wilmington & Northern.

The New York and Boston lines, between the two places named, viz.: Boston & Albany Railroad; N. Y. & New England; N. Y., New Haven & Hartford; N. Y., Providence & Boston; Old Colony; Fall River Line; Norwich Line; Providence Line; Stonington Line.

The Southern Passenger Association, composed of the following companies: Atlantic Coast; Atlanta & West Point; Brunswick & Western; Charleston & Savannah; Central Railroad of Georgia; Georgia Railroad; Georgia Pacific; Norfolk & Western; Pennsylvania Railroad (lines south of Washington); Port Royal & Augusta; Raleigh & Gaston; Richmond & Danville; Richmond, Fredericks & Potomac; Savannah, Florida & Western; Seaboard & Roanoke; Shenandoah Valley (lines south of Potomac river); South Carolina Railway; Western & Atlantic Railroad.

The Central Traffic Association, covering the following ground: Bounded on the east by Pittsburgh, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, but including points on either side of that river.

The Western Passenger Association, covering territory west of Chicago and St. Louis, declines to grant any concession on account of the probable limited attendance from this territory. Members interested are referred to the 5th rule below, under which they can secure special rates from Chicago and St. Louis. (The Chicago & Alton Railroad, operating in this territory, individually grants concession as herein described, from all points in Illinois to Chicago or Bloomington.)

The usual concession in railroad rates has been granted, namely, one-third off on the round trip. That is, members will pay full fare going, obtain a certificate from the ticket agent from whom they purchase their tickets, and, upon presentation of this certificate at New York, duly endorsed by Acting Secretary, they can obtain the return ticket at one-third the full fare rate. To illustrate: Suppose the regular fare from some point to New York to be $30. At the time of purchasing his ticket to New York the member pays $30 and obtains the necessary certificate from the agent; he has that endorsed by Acting Secretary, at New York; then, on presentation of the same to the ticket agent at New York, he can procure a return ticket by payment of only $10.

The following extracts from the regulations of the railroads are cited for the information of the members. *The special rates are granted subject to these regulations:*

1.—The American Gas Light Association is obliged to guarantee to redeem at full fare rates any return tickets procured by persons in attendance at meeting which may afterwards be found in the hands of "scalpers."

2.—The reduction is conditional on there being an attendance at the meeting of not less than 100 persons *holding certificates.*

3.—Each person to obtain the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request, the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

4.—If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through tickets can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where second purchase is made.

5.—Tickets for the return journey will be sold by the ticket agents at the place of meeting at one-third the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Acting Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

6.—No reduction of fare will be made on the return passage if the going ticket is purchased more than three days before the opening date of the meeting; except that when meetings are held at distant points to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

7.—Certificates are *not transferable*, and return tickets secured upon certificates are *not transferable.*

8.—The certificate of agent at starting point, duly endorsed by Acting Secretary of Association, must be presented to ticket agent at place of meeting, *within* three days (*Sunday excepted*) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

9.—No refund of fare will be made on account of any person failing to obtain a certificate.

Important.—Be sure to obtain your railroad certificate when buying your ticket for New York; apply for ticket and certificate at least 30 minutes before train time; be sure to have the Acting Secretary endorse your certificate at New York; apply for return ticket at least 30 minutes before train time, and have your certificate with you; members will please hand their certificates to the Acting Secretary, or his clerk, upon arrival at place of meeting; *if there are* 100 members present, holding certificates, each certificate will then be properly endorsed and handed back to owner, before adjournment; keep this circular in your pocket, and apply to it if you are in doubt.

ALEX. C. HUMPHREYS,
Drexel Building, Philadelphia, Pa. Acting Sec'y.

* Only for business originating at, or destined to, stations on the direct lines of these roads between Troy, N. Y., and Montreal, Canada.

CHANGES IN CONNECTION WITH THE NEW YORK MEETING.

The particular attention of our readers is called to the special circular published by Acting Secretary Humphreys, under date of the 7th inst., in which certain changes are set forth, which the exigencies of the situation brought about in respect of headquarters. The Committee of Arrangements had been positively assured weeks ago by Mr. Kinsley, of the Holland House, that the house would be completed in ample time for the reception of the American Gas Light Association, but it seems that the "Bishop's" promise was founded on the assurances of the contractors who have the finishing up work in hand, and the contractors, as usual, are unable to keep their pledges. Here, then, is a case in which history will not repeat itself; nor can it be said that the Association is to be a loser thereby. Last fall the Association "opened" the great De Soto, at Savannah, the remembrance of which surely will alleviate any grief at the prospect of being unable to "open" the Holland, in New York. New hotels are all very well in their way, but the hostelry that has seen some service, and whose reputation has been increased thereby, will likely command the attention of the traveller. In that understanding, the members, we think, will not be at all displeased over the notification that the headquarters are to be at the Gilsey House, Broadway, corner of 29th street, a house which for good appointment and convenience of location cannot be excelled. The Gilsey is on the European plan, and the committee has secured a special rate for rooms of $2 per day and upwards, or a schedule similar to that which was guaranteed by the Holland House proprietors. The Gilsey is a roomy house, and will in all probability be able to "take in" all those who elect to make their stay at it. The committee, however, has also made a special arrangement with the Sturtevant House, which is right on the other side of 29th street from the Gilsey, that will be pleasing to those who prefer to reside in a house on the American plan. The rate agreed upon is $3.50 per day, which covers all charges for single room and meals. Those desiring a parlor or bath room in addition to the sleeping room can secure the accommodation on payment of $4 per day; but it is essential that intending visitors *secure their rooms well in advance* of the days of meeting, so that disappointment will not be their portion. Both the hotels named are within easy distance and in direct line of the meeting room. The other hotels named are also convenient to headquarters. In the meantime, all who wrote for rooms at the Holland House may rest content in that they will find themselves comfortably quartered at the Gilsey. Meanwhile reassuring evidence of the interest generally taken in the welfare of the Association is furnished by the inquiries for membership blanks from those desirous of affiliating with it. We have so far received inquiries from 12 would-be members, all of whom we are certain will become enrolled. The Committee of Arrangements is busily engaged in perfecting the outing programme; in fact, it is virtually completed now. For excellence and variety it could not well be excelled, and with fair skies the pleasuring time of the convention will be "happy days" indeed.

THE CHICAGO GAS CLUB'S FIRST SESSION.

On Saturday next the first regular meeting of the newly organized Gas Club of Chicago will be held at Wilson's restaurant, 115 Dearborn street, the hour for the gathering having been put at 6 P.M. The regular business will be the election of officers, the adoption of a constitution and bye-laws, reports of committees, etc. These things having been passed upon, the members will enjoy an "informal supper," which, freely translated, may be taken to mean that those who eat will pay the shot. However, it will be none the less enjoyable or digestible on that score. It is presumed that all the charter members will be present, backed up by a goodly number of candidates for initiation. Come to think of it, the meeting night named ought to witness the arrival in Chicago of a number of those who intend to avail themselves of that "special car" which is to carry them to the New York convention. It is needless to add that the Gas Club's latchstring will be out to them, as well as to others of the fraternity who may be visiting the Fair City.

NOTES.—The Pennsylvania Supreme Court has sustained the opinion of Judge Simonton, rendered by the latter in the famous suit of the State against the Philadelphia Northern Electric Light and Power Company, in which the defense was that as the Company was a manufacturing enterprise it was exempt from certain taxes under the laws regulating such enterprises.——The fuel gas operators at Jackson, Mich., have applied to the Council of Lansing, Mich., for the right to operate a plant in that city. They guarantee to supply gas at a rate not to exceed $1 per 1,000 cu. ft. and within "a few years to reduce the price to 40 or 50 cents per 1,000." The application is to be made the subject for discussion at a "mass meeting," to be held in Lansing on Friday next, at which meeting the application of the old Lansing Gas Light Company for a renewal of its charter will also be discussed.

The Economical Working of Small Gas Works.

[A paper read by Mr. F. Weller before the Eastern Counties Gas Managers' Association.]

Considering there are in England no less than ten different Associations of Gas Managers, where from forty to fifty papers a year are read, it is somewhat curious that there are only about three of the whole of that number which are on the subject of small gas works. I hope, therefore, I may be excused for introducing it, and for expressing the hope that it will meet with a good discussion.

Assuming that the works have been built in the most convenient situation—viz., handy for carting coals, etc., by water, road or rail, and also at the lowest possible level obtainable, with plenty of room for extensions—the first thing to be considered is storage. At my works I have two holders 62 feet in diameter by 22 feet deep, each capable of containing about 62,000 cubic feet of gas. This, no doubt, would be thought by some to be rather large, considering that my annual make is only 14 millions. I find it, however, a source of great economy; and I am sure it doubly pays for the capital expended. Having this quantity of storage space, I can, by filling the holders full when the consumption begins to increase, run a fortnight or three weeks before I have to put on another bed of retorts. This means a great saving in labor and fuel. It is, of course, the same when the demand is decreasing. For instance, on the 1st of March this year I filled the holders up to 101,000 cubic feet; and let out a bed of six retorts. In working through the month, we sometimes lost as much as 6,000 cubic feet in 24 hours, and were sending out, on an average for the month, 2,000 cubic feet per diem more than we were making. So that at the end we had only 39,000 cubic feet of gas in stock, when we began to hold our own. By this we saved upwards of 30 chaldrons of coke and one man's labor. Before passing from the subject of storage, I may say that both our holders are fitted with circulating boilers, which I have found very convenient, especially last winter; for in the most severe weather, the water in the tank opposite the boiler was milk warm. I should strongly advise all who are not supplied with circulating boilers to have them before next winter. They cause little trouble; and the expense for fuel is slight.

I think the next important point to be considered is the most economical kind of retort setting for small gas works. Though we are not in a position to undertake experiments with regenerators or inclined retorts, I think in all smaller works a supply of secondary air might be tried. The plan on which my settings are worked [shown on a drawing exhibited] is very simple and inexpensive, as no special lumps or bricks are required, and they give much higher heats while consuming less fuel.

I also prefer oval to any other kind of retorts, as they wear better than the ⏏ shape, and afford more heating surface than circular ones. I have four beds in my retort house—two of five, and two of six retorts. The retorts in the former are 21 in. by 15 in., and 9 ft. long. The four bottom retorts in the beds of six are the same size; but the two top ones in each bed are 14¾ in. by 15 in. and 9 feet long. I had to make these smaller to allow room for the side middle ascension pipes. When building this stack, I had to put a bed of circular retorts in the coal store adjoining the retort house; and I have found it very convenient in the summer, when there is not enough work for the exhauster. At the same time it allows us to thoroughly clean, repair and renew, ready for the coming season. The mouthpieces are all fitted with Morton's patent lids of the latest type.

A word about ascension pipes. I think it is a great mistake to have anything less than 6 inch pipes. I have none smaller, and should not like to have any. We are never troubled with stoppages—a happy condition which, no doubt, may be attributed to our having the pipes large enough, and a good 14 inch front wall. Hydraulic mains I prefer in sections—one to a bed—fitted with a dip regulating valve to each section, so that the dip can easily be regulated to each bed of retorts. My condensers are vertical—three stacks of 5 inch pipes, seven pipes in a stack, with a circular box top and bottom. But if I were making alterations, I should certainly have one of Morris and Cutler's, as I think they are much more effective.

There is a great deal of controversy as to the best kind of engine to be used in small gas works. Some are in favor of gas and others of steam engines. I must say I very much prefer the latter, as most of my pipes lie very fleet; and in frosty weather I am obliged to have a jet of steam continually running through them. I have also steam in the suction and delivery tar pumps, as I pump the tar from the well, and deliver it into tanks about 30 yards from the pumps. I have also steam connections to the condensers, the scrubber and the inlet and outlet of the exhauster, the bye pass of which would be a source of great trouble, as

the pipe is only a 2 inch out of an 8 inch. This, I think, is a mistake. The bye-pass should be the same size as other connections—viz., 8 inches. It would be much more safe than with so small a throttle valve. The exhauster is one of Beale's; and I have no trouble with it so long as the governor and bye-pass are kept clear.

I think a scrubber fitted with boards is more economical than one charged with coke or boulders; and it is very simple. The way in which I charged my scrubber with boards was this: I took a template of the inside, with the outlet pipe in the centre, and had a number of ½ inch boards cut. I then cut the boards in lengths, put ½ inch pieces between them, put one layer one way and the next layer crosswise, and so on right up—forming ½ inch squares all over. These went on for a period of seven years without needing cleaning; whereas when the scrubber was charged with coke, it had to be cleaned out and renewed every two years. The same boards, after being cleaned, went in again, with the exception of a few broken ones. A word about the four way valve at the bottom. Of course, there are four divisions, and each division is provided with drain pipes to the seal cup. Now, the great mistake with these drain pipes is that they are much too small. I think they might carry the chambers the same size to form the seals, which would save a great deal of trouble, as most of the stoppages take place in this valve. I have a steam tap at the bottom of the scrubber, and one about half way up; so that I can clean out the scrubber in case of any tar getting in.

I have only three purifiers, 8 feet square; but I think of soon putting down another of the same size, for I do not consider a set of purifiers complete unless there are four. In my opinion, lime is better than oxide for small works, especially with only three purifiers. I use lime—three layers about 6 inches thick, and a top layer 9 inches thick. I tried to do away with two sets of grids, and laid the lime in double thickness; but I found this would not answer, as the lime in the centre of the layers was scarcely soiled, and did not purify much more than half the quantity of gas compared with the four tiers.

I consider that no works should be without a photometer and sulphur testing apparatus; the Harcourt color test being especially suited for small works, both for cheapness and simplicity. Governors, of course, must be arranged according to the levels of the district to be supplied, and the pressure kept as low as possible to prevent leakage.

Too much care cannot be given to mains and services. The former should be started large enough from the works, and continue the same size to the end of the district, instead of being reduced, as is often done. Of course, junctions to bye-roads may be smaller; but nothing less than 3 inch cast iron pipe should be laid unless for a special service, as the 2 inch pipe is liable to break where it is tapped. Indeed, I have found it broken in several places when I have been taking it up to lay larger; and I therefore make it a strict rule not to put in 2 inch pipes for mains. With respect to services, I think a manager ought to superintend every one that is laid, and not allow any man calling himself a gas fitter to lay them. I do not permit anyone to touch anything on our side of the meter, and not even to fix the meter. I have all this done by my own men. I contract from the main to the burners, if consumers wish it, and let them select their own fittings from illustrated catalogues, as I consider this is more satisfactory to them.

The public lamps ought not to be passed by without a few words. In the first place, those of you who have not already done so should take out all the ½ inch bends at the bottoms of the columns, and all the ½ inch pipes underground. I suppose there are not many here who did not have a great deal of trouble with them last winter. I know we had at Yarmouth; but we never allowed one to be out all night unless the pipe burst. There are several ways of clearing a frozen lamp. Some use spirits; but this takes half a night to clear half a dozen. We use a ½ inch rod, sharpened at the point, and run it down into the bend; we then have what we call our "gun," which is a common plug with a gun nipple tapped into the centre, put a little powder in the socket, screw it on to the top of the stand pipe, put a percussion cap on the nipple, and give it a tap with the pliers. This is almost sure to clear it. It is not economy to work with too short a staff of lamplighters, as a great deal of unaccounted-for gas occurs with the public lamps when the lamplighter cannot get round in the time allowed him. One word about lamp governors. I have tried a great many, but have not found any to equal those I am now using—viz., Hawkins & Barton's patent; and the same may be said of their burners, which I strongly recommend to all my consumers, and find they give great satisfaction.

I think every manager ought to do all he can to encourage the day consumption of gas for cooking, heating and motive power. We have reduced the price 6d. per 1,000 cubic feet for cooking purposes; and we fit up stoves and supply and fix meters free of charge.

With regard to general extensions, I think it is unnecessary expense, in a great many cases, to employ a consulting engineer; and I consider every manager ought to be able to design and superintend all alterations and improvements without any other help than that of a local architect and good tradesman.

Discussion.

Mr. W. Duesbury observed that Mr. Weller's remarks with regard to the storage of gas were very true. Plenty of storage meant economy; and to be short of storage meant—he should not say extravagance, but certainly waste. If they had to fire up beds of retorts just as the consumption varied, it was a very expensive proceeding. As to the question of main laying, he would reiterate the author's statement that 3-inch pipes were quite small enough; and if every manager would come to the decision never to lay pipes of less diameter, he would find it would be to his advantage.

Mr. W. Barratt remarked that there were several points in the paper which he did not think they would all agree with. With regard to the question of having photometers in small works, he did not consider it necessary to emphasize this as the author seemed to think. If they had photometers, it was necessary to have some one who could use them, and a great many men in small works were not capable of doing this. As to the size of gas mains, if pipes of small diameter were put down, they would cause trouble in many ways; and what the author had said as to service pipes, most of the members would endorse. He did not, however, exactly see the force of the "clearing out business" explained by Mr. Weller; but, on the whole, the paper was calculated to do good.

Mr. B. Gibson inquired whether the author considered that purification with oxide and lime was better than with lime alone.

Mr. W. J. Best observed that the paper covered such a wide range of subjects that it was impossible to deal with them all. With reference, however, to the construction of the retort furnaces, the question of a secondary air supply was perhaps a little fad of his own. If they had three fire bars in the furnace, it would be found that the flame would go up the chimney; but if they took out one bar and had two, using a secondary air supply, the heat would all be retained in the furnace. The paper also advocated the use of large, instead of small, ascension pipes to avoid trouble; but he (Mr. Best) thought, if the ascensions were kept a reasonable distance from the setting, they would not cause much difficulty. He disagreed with the author as to the way he used lime in the purifiers. In his own case, he now only employed one set of grids, and found he was able to do more work. As to the lime in the middle of Mr. Weller's purifiers not being soiled, this was owing to bad working; the gas no doubt simply passed up the sides of the boxes, instead of through the lime. In connection with the laying of cast iron pipes, he might mention that he only used galvanized pipes for services, and he had noticed in cold weather that iron pipes seemed to assist the formation of naphthaline more than galvanized ones.

The President remarked that the President of the Gas Institute (Mr. W. A. Valon, of Ramsgate) had honored them with his presence that day, and they would be pleased if he would take part in the discussions.

Mr. Valon said he had not prepared himself to say anything upon the paper, as he could not possibly know what it was going to contain; but he must say that the author had gone through his works from one end to the other in a way which showed that he himself was quite capable of managing a small gas works. There were, however, two or three points upon which there might be a little difference of opinion. The first was that gas works should always be at the lowest level obtainable. Now, he did not quite agree with this—that was to say, it was not at all necessary to have the works at the lowest possible point, unless the circumstances demanded it. Supposing they were depending upon their coal supply by rail, or had to cart the coal from the part where it was landed, then it was not at all essential that the works should be situated at a low point; indeed he (Mr. Valon) thought it an advantage to have the works on high ground. If the coal was brought by water, then it was necessary that the works should be at a low point; and this was the only excuse for having the works so situated. If the works were at a high altitude, then the smell which naturally arose from them passed over the town. The gas could be easily led to the lowest part of the district by a trunk main from whatever height the works might be—the governor being fixed at the works the same as if they were at a low point. Of course, the additional pressure at the works would be something more than if they were on low ground. If they were at an altitude of 100 feet above the lowest part of the district, they would require a pressure of $\frac{4}{10}$ to drive gas to that part. But supposing they had the initial pressure at the lowest point, and the gas had to rise 100 feet, at that height they would have an increase of $\frac{4}{10}$ in the pressure. It would be seen by these remarks that his idea was that, excepting where they had water carriage,

and other things being equal, the gas works should be rather at a high point than a low one. Then, with regard to the storage of gas, Mr. Weller had certainly erred on the right side in having two holders with a make of 14,000,000 cubic feet. He agreed with him that large gasholders were economical, and it was always advisable to have a considerable margin of storage on the works. With reference to the subject of purification, a question was asked as to whether oxide of iron was more economical than lime; but before this could be determined it was necessary to know the conditions under which the materials were to be used. As to the use of lime in the purifiers, he did not think there should be any difficulty in passing gas through 18 to 24 inches of lime, if it was properly slacked and turned and put into the boxes. He thought Mr. Weller would find there was some fault in the way the lime was used, if he had any trouble in passing his gas through such a thin layer as he would call 8 to 12 inches. Towards the close of the paper, he saw Mr. Weller was very anxious that gas managers should do all they could to increase the quantity of gas burned in their districts. He (Mr. Valon) thought that this was the great object of them all—they wished to see the gas works in their charge making as much gas as the district could consume. He might mention the great success that had followed the reduction of the periods in which gas accounts were rendered in the case of three or four works under his guidance, and especially at Ramsgate, where they had established weekly payments for gas, taking the payment in advance for (say) 500 cubic feet, and supplying the fittings free of cost. They charged a little more than the price to the ordinary consumer. The cost to the latter was at present 3s. 2d. per 1,000 feet, and the prepayment consumers were charged 3s. 9d., or 4½d. per 100 cubic feet. This was about ½d. per 100 feet more than the general consumers paid, and was for interest on the outlay for the fittings and the meter. By this means they found that, during the last two years, they had tapped a class of consumers they could never have got in any other way. In the two years they had added above 500 consumers, who would never have used gas at all if they had not introduced this scheme, for the simple reason that there were many persons who were not able to pay the first £4 or £5 outlay (which would be the average amount a gasfitter would charge) for fitting up a house. If the gas manager could relieve the occupants of small houses of this expense, and give them their fittings free of cost, simply asking them to pay weekly or fortnightly, it would be found they would have no difficulty in tapping a source of revenue which had never been opened up before. He was so thoroughly impressed with this that he really believed, when it came to be worked out, they would find that the present system of three months' credit was a mistake; and the shorter rendering of accounts and the more frequent payment of them would lead to an increase of consumption and a reduction of bad debts.

The President remarked that he thought the members were under considerable obligation to Mr. Weller for bringing forward a paper on the subject of the working of small gas works. They had a district which included a large number of small works, and to draw their attention to the principles that should guide them in conducting such concerns was extremely useful.

Mr. Weller, in reply, said as to Mr. Barratt's observation that in many small works they had no one to use the photometer and to make the tests for sulphur, he thought they ought to bring up their young assistants to do work of that description. With respect to the question of purification, he specially mentioned in the paper that his purifiers were only 8 feet square. His idea was that, with oxide, they ought to have a catch purifier, and therefore they should have four boxes. As to the depth of the lime in the purifiers, he tried the experiment of taking two sets of the grids out, and putting in a double thickness of lime. With lime the average amount of gas dealt with in his ordinary working was about 3,000,000 cubic feet for each purifier; but when he took out the two sets of grids, he could not deal with much more than half the quantity, and when the lime was removed, it was quite white in the center. With reference to Mr. Valon's remarks, he (Mr. Weller) thought it was an understood thing that gas works should always be at the lowest possible point. Where works were situated at a low level, one governor was generally found sufficient; but where works were located at a high point, three or four governors had to be used. If, however, they employed a trunk main as suggested by Mr. Valon, they could then possibly do away with two. With regard to Mr. Best's pet scheme of secondary air supply, he confessed that, when it was brought forward at the Ipswich meeting, he did not understand it. Before concluding, he strongly urged gas managers to have their holders fitted with circulating boilers.

IT is said that the product of the Castle (Montana) Coal and Coke Company is of excellent grade for gas making purposes.

Public Lighting in Eastern Europe.

The French Government having desired its Consuls in the principal towns of the east of Europe to report on the public lighting of those places, the representatives of France have furnished particulars on that subject, which are published in the *Moniteur Officiel du Commerce* for July 9th and 16th. According to these reports it appears that there exists no manufactory of lighting apparatus in Roumania, with the exception of one recently founded in Bucharest, and this, at present, does no more than produce wick holders for petroleum lamps; the cylindrical glasses for the same are principally made at the glass works of Azuga. It is intended to make lamps in the Bucharest factory, and before very long it is probable that the whole apparatus for lighting with petroleum will be manufactured at least in one place in Roumania. With the exception of certain small accessories, everything connected with lighting by means of gas has to be imported into Roumania from abroad. Most of the lamps now used in that country are furnished by makers in Austria-Hungary, mainly from Vienna and from Buda Pesth. Lamps are also imported, but in much smaller quantities, from Germany.

There is no gas used in any town of Roumania except Bucharest. Everywhere else simple petroleum lamps are used, and the town of Galatz is lighted by 1,695 of these. At Jassy the theater and the circus have lamps of vegetable oil, but everywhere else petroleum only is used in glass lamps with a straight wick. For domestic lighting lamps of all dimensions are used, with burners and circular wicks, all which lamps are imported from Austria or Germany.

When we turn to Servia, we find that Belgrade, the capital, contains no manufacturer of illuminating apparatus. The streets are lighted by a few petroleum lamps with reflectors, and when the municipality has need of a supply of lanterns, it applies to the Jewish tinmen, who produce what is required. Nisch is lighted only by petroleum lamps at certain important points of the town; and there is not even a shop devoted to lighting or lamps; the latter are ordered from Vienna or Buda Pesth, and sold by grocers or dealers in hardware.

In Sofia, the capital of Bulgaria, there are several dealers in lighting apparatus, but there is no manufacturer of these articles in any part of Bulgaria. What is used comes exclusively from abroad, and principally from Bohemia. There is a small importation of glass lamps from Belgium. No other substance than petroleum is used in any part of the country. Lighting apparatus only figures in the Bulgarian trade reports under the head of "glass manufactures." The figures of the import value of these articles, in 1889, was $26,500. In Varna, as in Sofia, petroleum alone is used for lighting. The favorite form of lamp is a cheap suspended lamp, with a single burner. There is a great sale at Varna of small lamps, specially introduced for the little towns and villages of the interior. These are made of glass, and cost about 18s. a hundred.

In European Turkey little is used except petroleum. Even in the public offices of Constantinople, into which gas had been introduced, it has been found so bad and so expensive that it has for the greater part been rejected and petroleum once more taken into use. In private houses, as in shops, *cafes*, and restaurants, nothing is now used but the large petroleum lamps. The electric light is employed only in the palace of Yildiz, it being forbidden by law to use it elsewhere. The supply of lamps for Constantinople is almost entirely in the hands of Austrian and German merchants. The kinds which they supply are usually of second-rate or even inferior quality, cheapness being an essential matter. The natives are in the habit of calling petroleum "gas," even when they are speaking French, but it is important to understand that they always mean petroleum. There are three French shops in Pera, and an Austrian house in Stamboul, where lamps of a better quality may be bought.

At Adrianople no gas is manufactured, and an attempt which was lately made to illuminate the city with the electric light was a complete failure. The only material used is petroleum, which is imported from the Russian establishments at Batoum. The city is lighted by cheap lamps on a most imperfect system, consisting merely of a cylindrical box of tin plate, scarcely eight centimetres high, and priced at from 16 to 18 cents each. The inside of certain establishments, such as the *cafes* and hotels, is lighted by lamps of a more elaborate description, from Austria or Germany. Austria inundates the country with a cheap article, devoid of all solidity of construction, but sufficient to satisfy the requirements of the Turks.

The only product employed for lighting purposes in the island of Crete, except candles, is Russian petroleum oil, of very bad quality, and dispersing a disgusting odor. The lamps are generally very common, but cheap. Most of them possess a glass reservoir, mounted on a stand in porcelain or metal. These are imported from Austria. No manufac-

turer of lighting apparatus exists in Eastern Roumelia. Petroleum lamps are used, and these can only be purchased in the capital, Philippopolis. At Bourgas, the chief port of Roumelia, all lighting apparatus has to be brought from Constantinople.

Oil is but very little used for lighting in Salonica, and, consequently, there is no sale for articles intended for this species of illumination. Gas works have recently been set up in Salonica, but, hitherto, the number of consumers is very small. Petroleum is almost exclusively used throughout the town, and there is a considerable market for apparatus used in this kind of lighting, portable lamps of all sorts, with glass, porcelain, etc. All these articles are of Austrian manufacture, and of inferior quality, but find a ready sale, on account of their cheapness. A Paris house attempted, some time ago, to introduce in Salonica lamps of its manufacture, but they were not bought, as they were too expensive. A manufacturer who wishes to sell his lamps in this town ought, first of all, to obtain information as to the price at which similar articles are at present sold there.

The only form of illumination which is employed in Albania is petroleum lamps, the importation of which reaches a value of $2,500 or $3,000 a year. None are manufactured in the country, even at Janina, Scutari, or Durazzo, but are manufactured in Austria and introduced from Trieste to ports along the Albanian coast, and sold in the bazaars. In Bosnia-Herzegovina, also, gas and oil are totally unknown as illuminants, and the whole country depends on the importation of cheap petroleum lamps from Austria.

In Greece, gas is used in the towns of Athens and Corfu. In the former everything connected with lighting by gas is supplied by a French company on the spot; in Corfu the apparatus has to be imported from an English gas company at Malta. In the rest of the country lighting is almost exclusively performed by means of petroleum lamps of Austrian or German manufacture. At Syra there exists no person who regularly sells lighting apparatus of any description, but very bad porcelain or metal lamps may sometimes be picked up at the china or tinshops. There was once a proposal that Syra should be lighted with the electric light, but the poverty of the municipality and political reasons combined to prevent it.

Mr. T. B. Sandwith, Her Majesty's Consul General at Odessa, writing to the Foreign Office, under date of the 1st of August, says that the port of Odessa, in contradistinction to the town of that name, having for many years remained unlit, even by oil lamps, and, within two years only, being lit by gas, has at length been illuminated by electricity. An installation has been completed, at a cost of 80,000 roubles ($42,000). This consists of 64 arc lamps, of 2,000-candle power each, and of two lanterns, one at each end of the breakwater, which runs the whole length of the port. The illuminating power is generated by two of Wilson's vertical engines, of 67-horse power each.

The Odessa Town Council has just assigned a sum of 20,000 roubles ($10,500) annually for the working expenses.

The new installation is a great boon to the shipping interest, the whole of the port being brilliantly lighted up, so as to admit of the loading and discharging of steamers by night.

A Central Station Combining the Advantages of Both the Continuous and Alternating Current Systems.

[A Paper read by Mr. H. Ward Leonard before the National Electric Light Association.]

We are all well aware of the fact that the greatest strength of the three-wire system is due to features, the lack of which constitutes the greatest weakness of the alternating system, and that the reverse of this statement is equally as true.

The high efficiency, reliability, safety and adaptability to supply almost any requirements for electric energy, which are the features of strength of the three-wire system, are the very points upon which the alternating system suffers by comparison, (for its efficiency is much lower, its reliability is less due to the fact that its machines are not practically operated in multiple arc, its safety is necessarily less due to the existence of the high primary pressure, and its current is not adaptable to commercial use for motors, charging storage batteries, electro deposition, and so forth.)

On the other hand, the low first cost of an alternating system, the simplicity of its circuits and of the operation of the central station and its ability to reach with moderate expenditure of capital, lighting at any practical distance, make it the only possible pioneer in new and untried territory without great risk and almost the certainty of expending capital which will never be remunerative.

Hence, it is that we find the three-wire system in possession of the densely settled centers of cities and towns, and not extending to the outskirts because of the uncertainty of a sufficient return upon the necessary capital, and both the central station manager and the distant would-be consumers anxiously awaiting the development of improvements which will enable the three-wire central station to supply such distant consumers. And hence it is that the manager and consumers of an alternating system anxiously await the day when motors can be operated and a more economical, safe and reliable current than the present alternating current can be furnished by such a station to supply the imperative wants of the heart of a busy city.

If the above statement of the present existing conditions be a fair one, it will be evident that if we could only in some way secure the advantages of both systems in a common distribution, we should greatly improve matters. The object of this paper is to point out what appears to the writer to be a step forward in that direction.

The following conditions seem to be necessary:

1. We must supply a continuous current for the central portion of a town during the daytime when power is required.

2. We must supply the outlying districts with an alternating current during the night time when lighting is required.

3. We must not operate the alternating system under conditions of light load when its efficiency is very low.

4. We must be able to supply current for lighting continuously throughout the 24 hours of the day.

5. We must have but one set of conductors in any consumer's place.

In order to meet the above conditions I propose the following:

1. Wire all consumers upon the standard three-wire system.

2. Connect all consumers upon standard three-wire mains.

3. Arrange the network of mains so that the central section of the network can be disconnected from the outlying sections through the agency of switches.

4. Install three-wire feeders to supply the central portion of the systems at full load, and install 1,000 volt primary wires and alternating current converters with a three-wire secondary circuit to supply the outlying section at full load.

Let us see how we will operate the station. Suppose it is eight o'clock in the evening. The switches which serve to connect the central and outlying sections are open, and our three-wire plant is supplying the full load of the central portion of the city. The alternating plant in the same central station is supplying the converters of the outlying section, which convert from 1,000 volts primary to 220 volts in the secondary, and the secondary coil has a connection at the center which is led off to supply the central wire of the three-wire system of the outlying section, the outside terminals of the secondary being connected to the outside wires of the three-wire system. It will be noticed that both plants are being operated at full load.

Now, suppose it to be eleven o'clock. The load has gone off rapidly so that the alternating plant is now operating under the worst possible conditions, and these conditions will continue for the outlying district until dusk the next day—that is, for probably 18 hours. An operator is now sent out who goes to each section supplied by a converter, and by throwing a switch transfers the secondary wiring from the alternating system to the three-wire mains. In this way the small remaining load is gradually transferred to the three-wire plant and then the alternating plant is shut down. The three-wire plant continues in operation all night and all the next day, supplying all devices with a continuous current. Motors can be operated in all portions of the system, even for domestic purposes in the distant residences, and all consumers get the opportunity of the use of the continuous current for any purpose desired for 18 hours out of the 24.

Dusk now arrives and soon the heavy lighting load will rapidly come on, and in such case the outlying section could not be supplied by the small wires feeding the distant three-wire section during the day, which are only about one-tenth the size which would be necessary to supply the full load.

The operator again goes round the circuit and now transfers the load of the outlying section from the three-wire plant to the alternating plant, and this condition prevails again until eleven o'clock arrives, when the operation is repeated, as before described. The switches for transferring the load of the outlying section from one system to the other, can readily be controlled by simple means from the central station itself, if desired.

Now, let us look at some of the advantages we have gained. All of our inside wiring is done on the three-wire systems for use of a lamp of 110 volts. This means that for the same distances and loss in conductors we will save eleven-twelfths of the cost of copper which would be required by a secondary using 55 volt lamps upon a two-wire system; or

to put it in another way, we can supply 110 volt lamps upon a three-wire system with the same cost of copper, and the same percentage of loss in conductors at three and a half times the distance which would be permissible for 55 volt lamps on a two-wire circuit.

We all know the great desirability of using large converters, on account of their cheaper first cost per lamp and their higher efficiency, and also because a far more perfect regulation of pressure can be obtained upon a lot of lamps scattered in different kinds of stores throughout a block, if they be supplied from one converter, than can ever be obtained by supplying these lamps by a lot of small converters loaded differently in almost every case, and consequently supplying a different pressure at the secondary terminals of each converter.

Under the system proposed by me one converter would ordinarily supply the entire lighting of a block, resulting in less first cost, higher efficiency of conversion, longer life of lamps, greater reliability and greater simplicity of plant.

A point worthy of notice is that for 18 hours out of the 24 an absolutely safe pressure is in use throughout the entire system, and that during all daylight hours, when the greatest liability to accident from contact with high pressure wires exists, no high pressure is in use. With such a system no consumer need be turned away.

The consumer who wants to charge storage batteries, and also make electric welds by electricity, can do so upon the same day and from the same wires that supply his incandescent lamps. The factory upon the outskirts of the town, which runs its isolated plant, and must to-day either use storage batteries or run machinery all night to supply a few watchmen's lights, can now switch on to the central station at six o'clock and operate the few lamps it may need until dusk next day, when heretofore the alternating system, which was the only one which could reach it, did not run after midnight, or possibly after daybreak, because of the loss of money in so doing.

With this system the outlying districts can be pioneered with the least first cost and least risk. Any outlying section in which, for any cause, the demand increases greatly beyond that originally anticipated, can be supplied permanently by the 3-wire system by merely running the necessary feeders to supply the already existing mains, and in such case the switches and converters would be moved out further or transferred to some new section ready for pioneer work.

The combination of a storage battery system and an alternating system also presents peculiar advantages. The storage battery is at its best when supplying a small, steady load, such as we have for at least 16 hours out of the 24. The alternating is at its best when supplying the full load possible only during the remaining eight hours. The average electrical load on a general system is about 12 per cent. of the maximum, consequently we are entirely safe in the statement that the greatest load during the 16 hours of light load is not more than 10 per cent. of the maximum load for the 24 hours.

If we were to attempt to operate the heavy load by storage batteries, we must either make an enormous investment, or, what is even worse, operate storage batteries at a disastrous overload. On the other hand, if we try to operate the 16 hours light load with converters, our efficiency, when operating at 10 per cent. of our converter capacity, would be unmentionably low. But reverse the case and everything works at its maximum efficiency. During the eight hours of possible heavy load, we operate all devices by the alternating system. At the same time a continuous current dynamo charges our storage batteries located either in the central station, or, if more desirable, at different centers in the system of distribution. At the end of the eight hours' run we shut down the plant, lock up the station, and leave it for 16 hours, the storage batteries meantime supplying all devices.

If, for extraordinary reasons, we have not capacity sufficient in the storage batteries to supply the demand, we run the continuous current plant to assist it; and if that should fail or prove insufficient, we start up our alternating and supply all or a disconnected part of the system with it. With this plant distances are of no consequence; we can use 1,000 volts for the continuous current plant as well as for the alternating, and the single 2-wire distribution is all that is necessary for perfect results.

The weak spots of this latter arrangement will, no doubt, be thought to be the storage battery, but my experience with this device is that if you use it properly under suitable conditions, and do not attempt to squeeze impossible results out of it, economical and satisfactory service can be obtained from it, and certainly no better conditions could be obtained from it than those described above.

Up to this time a bitter fight has waged between those believing that the alternating, the direct, or the storage battery system, respectively, was the only suitable one. I believe in them all, each operated so as to be used under the best conditions for its use, and I trust that the suggestions given above may lead to our being better able to meet and overcome our common enemies—high first cost, low efficiency, danger, unreliability and the inflexible conditions of the existing demand.

The Theory of Smoke and the Evils of Incomplete Combustion.

Mr. C. Chomienere, in a series of articles in the *Railroad and Engineering Journal* on "Combustion," while dealing with the chapters devoted to the matters named in the above headline, remarks that pure carbon when burning, even with an insufficient supply of air, never produces smoke. It is the same with charcoal and with coke. The hydrocarbons, on the other hand, give much smoke whenever they are burned with too small a supply of air. The experiments of M. Berthelot have proved that when we heat certain hydrocarbons to a fixed temperature we produce a new hydrocarbon, more condensed, with a deposit of pure carbon. Let us see what takes place on a grate charged with coal.

If we assume that this grate is covered with coal half consumed, and that it contains only coke in an ignited state, it will not produce smoke, but if we throw fresh coal upon the fire we see at once black smoke rising from the mass and passing into the smokestack. Quickly the smoke diminishes in quantity and ends by disappearing entirely until another charge of coal is thrown upon the fire. Let us see what has been found in this case. At the moment when the coal touches the ignited surface, the hydrocarbons which it includes feel the action of a high temperature and their distillation is produced. These vapors coming into contact with the air immediately burn and consume the oxygen surrounding them. If no fresh air comes to renew the supply of oxygen a quantity of gas is formed which will be carried into the chimney in the same state in which it was when it left the grate—that is, imperfectly burned. This explains the presence of hydrocarbons in the gaseous products of combustion.

There is still another thing to take into consideration—the dissociation of gases, an admirable discovery which is due to M. Sainte Claire Deville.

When a compound gas is brought to a sufficiently high temperature, the elements which compose it will separate, but if the mixture resulting from this separation is quickly cooled, we find instead of the compound gas which we had originally a simple mixture. If, on the other hand, the cooling is slow, the elements will recombine and we will have the original compound gas.

In consequence, at the moment when the hydrocarbons are disengaged and are carried to a very high temperature they become a mixture of carbon in a state of vapor and of hydrogen. If a sufficient quantity of air is furnished the combustion will be complete; if not, it will be imperfect, and we will have the first case when the cooling is slow; but if the cooling is rapid—as may happen if the gases come in contact with the passages or with the bridge, or even with a current of cool air—the carbon will appear in the form of black smoke and the hydrogen will remain free. This accounts for its presence in the gaseous products of combustion, and also for that of a new quantity of hydrocarbons which are formed by what M. Deville has called a partial recomposition.

In the passages of a boiler all these phenomena are partially reproduced. When the gases touch the walls of the boiler, which are at a comparatively lower temperature, smoke is produced by the precipitation of the carbon. There also results the rapid heating of the hydrocarbons on the grate, producing the reaction shown by M. Berthelot, and the rapid cooling of the gases resulting in the reaction of M. Deville; these are the two principal causes of the formation of smoke. There is always a lack of air, which is, if not the only cause, at least a necessary cause. In spite of this, and according to careful experiments, smoke, if black and as thick as it can be even when produced by design and not by giving the firebox a sufficient quantity of air, will not represent a loss of more than 1.5 per cent. If the supply of air is increased a little this loss will fall to 0.5 per cent.

As we have before stated, the composition of the gaseous products of combustion varies very greatly as the smoke is black, light colored, or almost colorless. Each of these states corresponds to a different degree of loss, and the blackest smoke is that which shows the most imperfect combustion. This is generally true, but it is hardly necessary to believe that in all cases the loss shown would be proportional to the color of the smoke, since it may happen that colorless gas includes carbonic oxide, which constitutes a greater loss than that resulting from black smoke.

In order to know how during a definite time—100 minutes, for example—the three conditions of the smoke are presented, M. Burnat

made a series of experiments. He took the most unfavorable conditions and used an oily coal, which is certainly the fuel most apt to give rise to loss of heat by incomplete combustion. He carried the combustion of carbon to its maximum point with an insufficient quantity of air in such a way as to produce as much black smoke as possible; using 2 kg. of coal per hour per square decimeter of grate surface, and a supply of 6 cu. m. of air to 1 kg. of coal, he found that black smoke was given out for 32 minutes; gray or light colored for 33 minutes; and colorless for 35 minutes. He then tried the reverse conditions; that is to say, he reduced the consumption to a minimum, 0.54 kg. of coal per hour per square decimeter of grate, with a large supply of air—16 cu. m. per kilogram of coal. He then found that black smoke lasted 4 minutes; gray, 27 minutes; and colorless, 69 minutes.

For his third trial he adopted the average combustion; that is to say, about 0.75 kg. per hour per square decimeter of grate, with a supply of 15 cu. m. of air per kilogram of coal. In this case he found that black smoke lasted 10 minutes; gray, 30 minutes; and colorless, 60 minutes. M. Burnat afterwards analyzed each of these kinds of smoke, with the results shown in the table below:

Component Gases.	Black Smoke.	Gray Smoke.	Colorless Smoke.
Carbonic acid	11.00	8.00	10.86
Oxygen	7.20	12.90	11.48
Carbonic oxide	1.55	0.18	0.00
Hydrogen	0.58	0.93	0.33
Nitrogen	79.67	77.99	77.33
Total volume	100.00	100.00	100.00

These analyses do not show carbon except in combination with oxygen in different proportions.

It follows from this examination that the loss due to smoke under good conditions of combustion is quite insignificant. It is true that we look for smoke-consuming apparatus not only for reasons of economy, but for others connected with property, and especially with public health.

In fact, it is not carbonic acid which is most noxious in smoke. It is dissipated physically in the air, while the carbonic oxide is much more dangerous. It attacks the organs of breathing, and is really a very deleterious gas. It is especially dangerous because its density is 0.97—almost equal to that of the air—and for this reason it is apt to be uniformly diffused through the atmosphere; while carbonic acid, having a density of 1.53, or one-half more than the air, is always found close to the surface of the ground.

A few thousandths of carbonic oxide in the air are sufficient to destroy the most robust health, and on an average from 1.2 up to 3 per cent. is found in smoke. From that statement one can judge the mass of poison which is daily diffused in the air. The very poisonous quality of this gas results chiefly from the property which the blood posseses of absorbing it in the same degree as it is introduced into the lungs and transforming it into a poison which acts upon the nervous centers.

As to carbonic acid, it can be absorbed in a very considerable quantity without injuring animal life. There are fortunately many causes for the absorption of this gas. Water transforms it into carbonates of iron or other oxides, and plants especially absorb considerable quantities of it. There is thus an equilibrium which we cannot admire too much, and which is for us an essential condition for life.

As nature thus charges herself with the disposition in large part of the carbonic acid, it devolves upon man to prevent in every possible way the formation of carbonic oxide, and to prevent also the injury which it causes in the human organism.

Economical Review of Alabama Coal Fields.

[A paper read by Mr. C. R. Claghorn before the Engineers' Club of Philadelphia.]

The coal producing area of Alabama lies in three separate fields, known as the Warrior, Cahaba and Coosa fields, these names being derived from the rivers which drain their respective areas. The Alabama coal fields form a prolongation and the southern terminus of the great Appalachian coal field; and the measures are directly traceable from Alabama, through Tennessee, northeastward. Following the rule of the measures affected by the Appalachian mountain disturbance, their strike is from northeast to southwest, in Alabama, at the same time showing a general pitch to the southwest. Local geological disturbances, and subsequent erosion, have divided the once entire field into three separate areas, as before indicated, which lie parallel to one another, separated by comparatively narrow valleys of the older formations.

The Warrior field is much the largest of the three, having an estimated area of 7,810 square miles. In general form it is a shallow synclinal, the axis of which is nearest to the southeastern outcrop, thereby causing the northwest dips to be sharp to the axis, with much less pronounced (in fact almost flat) southeast dips. Several minor flexures occur in the Warrior basin, being most pronounced in the northeast area, where they somewhat affect its outline; but these flexures die out and disappear before they reach the middle or main body of the field.

Conservative reports indicate the existence of seven seams of coal of workable thickness (three feet and upward) over a considerable area of the field, the upper seams of course being the more limited. Other coal seams exist and may be found to be of local importance at many points. The coal seams show a tendency to thin from the southeast outcrop toward the northwest, at the same time thickening along the strike toward the southwest, so that it would appear that a line of average thickness might be drawn diagonally across the field.

Another feature of the Warrior field is the noticeable increase of hardness in the coals toward the northwest. All coal mined along the southeast outcrop is very soft and friable, suitable only for steam and coking purposes. The harder coals, suited to preliminary preparation by screening for steam and domestic use, are found only in the interior of the field and toward the northwest edge.

The chemical composition of the Warrior coals remains about the same over the entire field, and shows no sign of altering with the physical character. All the coals so far found or worked may be classed as medium bituminous. No very dry coals, high in fixed carbon, have been found; nor, on the other hand, have gas coals, rich in volatile hydrocarbons. Carbon runs from 55 per cent. to 63 per cent.; volatile matter from 28 per cent. to 34 per cent.; ash from 5 per cent. to 10 per cent.; and sulphur from 0.5 per cent. to 2 per cent. The moisture in all Alabama coals is quite low. Many analyses and individual samples may show results outside the above limits; but from personal experience I should say that these limits are wide enough to include all Warrior field coals in commercial lots. Notwithstanding a seemingly unchanged chemical composition throughout the field (by unchanged I mean in a noticeable and regular degree), the coking properties grow feeble toward the northwest and appear to decrease with the increase of hardness. This fact, however, is more particularly noticeable in the lower seams that cover the greatest area.

From the foregoing it may be deduced that the best coking coals come from a strip along the southeast edge of the basin; that the best lump and domestic fuels and coals best suited for handling in transport will come from the interior.

Owing to the pitch of the Warrior field (a similar pitch being exhibited in the Coosa and Cahaba fields), the thicker seams, found more in the middle and upper part of the coal measure proper, only underlie that part of the field lying to the west and northwest of Birmingham and west of the Louisville and Nashville Railroad, running north across the field. Such coals as are found north and northeast of Birmingham and east of this line of railway belong to the lower measures. While in many cases marketable, they are thin and expensive to mine, and in competition with other coals may either be crowded out of the markets or yield a very small margin of profit.

The Cahaba field, with an area of about 435 square miles, lies next southeast of the Warrior field. It is long and narrow, somewhat spoon-shaped, bulging out toward its southwest extremity. The geological disturbances of this field are much more numerous than in either the Warrior or Coosa fields. Several minor faults extend through the field, with a northeast strike along the axis, and the whole of the southeast edge of the basin is cut off by a large fault estimated at 10,000 feet, by which the Silurian rocks are brought up against the coal measures. This fault cuts out all the northwest dips of the basin, so that all the general dips within the field are toward the southeast, except where local disturbances occur, and therefore there is no southeast crop. The pitch of the basin is toward the sonthwest along the strike, though to a less degree than that exhibited in the Warrior field. A general thickening of the measures is also noticeable in this direction.

The coals of the Cahaba field have been divided into two groups, separated by several thousand feet of barren measures. The upper or Montevallo group, containing four or five seams, three being probably of workable thickness, exists only in the southern part of the field, and on account of the high degree of pitch and broken and disturbed condition of the measures, is of small importance except in possibly one or two small local basins.

The lower or Cahaba River group contains some seventeen seams, of which seven may be considered workable. The general opinion has

been held that the coals of the spoon-handle or upper field are worthless on account of their dirty and slaty condition, and also on account of the tendency to thin in that direction.

The coals of the Cahaba field are strong, hard coals; in general compact, and exhibiting but little cubical fracture. They do not weather, and stand handling well, and are therefore adapted to long transport and transfer like the interior Warrior field coals. They are also noticeably free from slate partings, which are quite prevalent in the thicker coals of the Warrior field. They are quite regular in chemical composition, showing from 30 per cent. to 33 per cent. of volatile matter; 60 per cent. to 63 per cent. of carbon; 3 per cent. to 6 per cent. ash, and from 1 per cent. to 2 per cent. sulphur. The field, as at present developed, produces the best "all round" coal in Alabama. It makes an excellent coke, is a good domestic and steam coal, and its physical characteristics are such that it bears transportation and handling well.

But little is known of the Coosa field, with an area of about 415 square miles, beyond the fact that it resembles the Cahaba field geologically, though the dips are much flatter. It contains two or three workable seams of good coking and steam coal, but very soft in texture and unfit for handling. There are only two operations in the field, at St. Clair and Ragland, which, in point of production, are of minor importance.

In reviewing the Alabama fields from an economical standpoint, requiring the geographical position with relation to markets and present railroad developments and prospective lines, character of coal and relative cheapness of mining, etc., to be taken into consideration, it would appear that, except for local uses and purposes, the northeastern Warrior field coals, including the coals at and north of Warrior Station and to the eastward, would not be available on account of high cost of production. The price for digging is 70 cents per ton, the seams being thin (3 feet) though of excellent quality.

The coking coals will naturally continue to be drawn from the established coking districts of the Warrior field and to some extent from the Cahaba field, being closer to the large ore deposits and to the center of the iron-making district of Birmingham. Growth in iron production will naturally increase the consumption of these coals. As before remarked, most of the coals of the southeastern edge of the Warrior field are coking coals, though the present supply is mainly drawn from the Pratt and Newcastle seams, the former being from three and a half to four and a half feet thick, and the latter from seven to eight feet. The coals of the Pratt seam, paying 45 cents for mining, cost about 75 to 85 cents on cars; while the coals of the Newcastle seam, paying 40 cents for mining, cost from 60 to 70 cents on cars. These same coals, being excellent steam coals as well as coking coals, enjoy a wide market locally and for shipment outside of the immediate Birmingham district; but they are too soft and friable in structure to be used for domestic purposes and for purposes requiring handling as in the export trade.

The interior Warrior field coals, being harder, are largely used for domestic purposes and also for steam making. For the former purpose they are shipped east to Atlanta and other points in Georgia; northwest to Memphis, and west and southwest to and even beyond the Mississippi River. At these points they meet competitive coals from other States, and their comparative use is limited by the railroad rates which they are required to pay. There being no through north and south lines of railway through the Warrior field except the L. & N. Railway, which, as before remarked, taps only the thinner coals of the lower measures to the immediate north and east of Birmingham, the interior Warrior field coals, those of a harder character, are not available for southern shipment to any great extent. Their natural outlets are east and west, along the line of the Georgia Pacific Railway, and northwest on the Kansas City, Memphis and Birmingham Railway, with possible divergences for some distance north and south on crossing lines of railway outside of the main coal roads.

The Cahaba field, producing both steam and domestic coal, enjoys a favorable geographical location for such trade as may be developed to the south, southwest and southeast, being tapped by through lines diverging in these directions. This territory offers the most advantages, the main points being to a less degree subject to competition from other than Alabama coals.

Birmingham and its immediate vicinity is the dumping ground for almost all Alabama coals, for, being the headquarters for all the producing companies, business there is more actively worked.

The coal railways of Alabama have all established the rule of not allowing their coal cars to be shipped to points off their own or closely allied lines. This makes it impossible for mines to compete successfully for business at local points on other coal roads.

The Louisville and Nashville Railway, with its operated line, the Birmingham Mineral, reaches north and south through both the Warrior and Cahaba fields, and by the Mineral branch taps many mines in the Cahaba field and along the southeast edge of the Warrior field. This road names "blanket rates" for all mines to Birmingham and to all local and competing points, thereby putting all its mines on an equality as to freight rates.

The Alabama Great Southern, extending through Jones Valley northeast to southwest, taps the coal fields at only one point, namely, through the Cahaba Coal Mining Company's road at Woodstock. This road then draws its supply from the Cahaba mines at Blocton and from those mines near Birmingham which, by their own short lines of road, reach all railroads. A Birmingham rate applies to all coal shipments on this road.

The Georgia Pacific Railway divides its mines into three districts: an eastern district, including all the mines near, and 20 miles west of Birmingham; an intermediate district, and a western district. The rates for each district vary for east and west shipments 10 or 15 cents per ton. Naturally, the western district coals go west, and the eastern district coals go east, while the intermediate mines ship domestic coals both east and west (the eastern coals being soft and friable) and steam coal mainly west.

The Kansas City, Memphis and Birmingham Railway, which ends at Birmingham, practically names a different rate for each mine. This places the intermediate mines at a disadvantage, the coals on this road being more alike than on the Georgia Pacific, where the intermediate mines furnish a coal quite distinct from the eastern coals, thereby allowing them to develop a trade of their own eastward. But Birminham, being the eastern terminus of the road, places the eastern mines at a disadvantage, since they are unable to regularly procure a full supply of cars for shipments beyond Birmingham, on account of the rule before mentioned, and at the same time, by paying the local rate into Birmingham, are placed at a disadvantage as compared with other mines, which at once take the Birmingham rate to other points on such roads.

The Columbus and Western (Central of Georgia), though cutting the spoon handle of the upper Cahaba field, is not distinctly a coal road, having but one operation on its line, which, on account of a bad roof and much water, produces an expensive coal. This road then draws its coal from the local mines near Birmingham, possessing their own lines of railway, and from the Georgia Pacific and the Kansas City, Memphis and Birmingham Railroad, the mines possessing the best local rates to Birmingham on their respective grades of coal being best able to compete for the business on the road. Steam coals come from local Birmingham mines and from the eastern mines of the Georgia Pacific and the Kansas City, Memphis and Birmingham, and domestic coals from both the latter roads.

The Cahaba Coal Company, operating the only extensive mines in the Cahaba field, having much water and a poor roof to contend with, have established a relatively high price for their coal. This price has also been adhered to by the local mines, which have the advantage of freights to the southern territory. This enables some inferior Warrior field coals to reach these markets by absorbing the difference in rates in the f. o. b. mine price for coal, either by way of Birmingham or westward on the Georgia Pacific to a connection with the M. and O., Illinois Central, or L. N. O. and T., reaching south.

The interior Warrior field coals, lying in Walker and Tuscaloosa counties, are undoubtedly the cheapest coals to mine, on account of their thickness, dip, character of roof, etc. It would appear that the needs of the district are either through lines of railway, extending north and south to tidewater, or branches of existing north and south lines, penetrating into the interior Warrior field, by which an equitable rate and many other vital facilities for doing business in the southern territory could be given this field. By cheapening the cost, the use of Alabama coal will be extended.

The wonderful growth of industrial enterprises in Alabama, Georgia, Mississippi and Louisiana, the legitimate field for Alabama coal operations, will absorb a constantly increasing tonnage. This growth will call for more coal to the south and southwest than in other directions, outside of Birmingham's immediate vicinity; but this growth will hardly keep pace with the increased tonnage of the mines; for already an unhealthy state of the coal trade exists at certain seasons of the year, so that it is to an export business to the West Indies, Central and South America, Mexico and to American Gulf points, that Alabama must look for a market for her surplus coal. The coals most suited for this can only come from the Cahaba field, the mines near Blocton already doing considerable business of this kind, and from the interior Warrior field, which, as has been pointed out, lacks the railroad developments necessary to enable it to compete for the business.

Taking into due consideration the cheapness and quality of the coals,

it would appear that the best of Alabama's territory has yet been untouched. A road passing northeast from Tuscaloosa would pass through a rich coal area, where the coals and coal measures are thickest, the coals of excellent quality, suitable for any purpose, lying favorable for mining in easy dips and under good cover. There are also portions of the Cahaba field, yet undeveloped, which give promise of a bright future.

Chimney for the Narragansett Electric Lighting Company, Providence, R. I.

[Abridged from a paper read by Mr. J. T. Henthorn before the American Society of Civil Engineers.]

The chimney for the Narragansett Electric Lighting Company, of Providence, R. I., was designed by the writer's firm (Remington & Henthorn), and built under their supervision. It forms a part of a large central station, which was in process of construction at the same time under the supervision of the same designers.

The location of the center of the chimney is 101 feet west of the harbor line of the Providence river, and the foundation, which was begun in August, 1888, formed part of a general contract for other portions of the station. This foundation consists of piling and concrete, and to arrange for it a space 44 feet square was first excavated 5 feet 6 inches below zero line or high water, and the sides protected by driving 3-inch spruce sheet piling 16 feet long. Over this excavation the pile driver, having a ram weighing 2,200 pounds, was rolled. Spruce piles 50 feet long, and spaced 30 inches center to center, were driven as far as possible without breaking. These piles were cut off uniformly at 5 feet below the high water line, the earth around their heads thus being 6 inches below their tops. The intervening space between the sheet-piling was filled in with concrete composed of one part of Norton's hydraulic cement, two parts sand, and three parts coarse gravel and broken stone. This mass was carried up to the 1 foot 3 inch level, and consequently formed a foundation 6 feet 9 inches thick, with the head of each pile projecting 6 inches therein. This was then covered with earth and allowed to season during the winter.

On May 31st, 1889, work was resumed by laying the first brick of the chimney. This was carried up in the form of a square of 36 feet to a height of 3 feet 2 inches, and from that level the base of the chimney proper, which was 28 feet 6 inches square, was started.

The center of the chimney was fixed by building into the brickwork a cast iron plate, upon which was a well defined center mark. From this center mark all measurements and plumbing were established while the chimney was being built. As each 20 feet in height was built, the center of its axis was re-established, and if any deviation from the plumb was found it was corrected before the next 20-foot level was reached.

The base of the chimney, which, as before stated, is 28 feet 6 inches square, consists of three walls—an outer wall 28 inches thick; an intermediate wall, octagonal in form, 12 inches thick; and a core wall, circular in section, 16 inches thick. The outer and intermediate walls are joined by pilasters 12 inches thick.

In commencing the base of what might be termed the core wall each course of brick was set back 2½ inches from the previous course, until the inside diameter, 14 feet, was reached, when the wall was carried plumb 16 inches in thickness up to the 78 feet 2 inch level, where it was reduced to 12 inches and run up to 193 feet 2 inches, when it was again reduced in thickness to 8 inches, and thus carried to 249 feet 9 inches. This wall complete was laid in lime mortar, which had been slaked from three to six months before using. The outer wall, of rectangular cross section, was carried up to the 38 feet 2 inch level, where at each of the four corners cut granite blocks were placed, to change from a square to an octagonal cross-section.

This granite work is made up of three pieces in the lower course of 2 feet 8 inches in thickness, and two courses with one stone each, also 2 feet 8 inches in thickness. On the angular face of these stones was cut a triangular section or projection to relieve the monotony of a plain surface, and when in place they fulfilled their mission to perfection. Level with the top of this granite work, and in the center of the panel of the octagonal side, is laid a terra cotta brick belt course, which thus forms the commencement of the 24 inch pilasters at each of the octagonal corners, and leaves an intervening panel 4 inches deep, of varying width as the chimney is reduced in size by the batter. These pilasters are carried up to the 223 feet 2 inch level, at which point the first projection for the head is made, and from that point carried still further, on the same batter, up to the crown of the arches, which are then turned between the panels.

The outside wall, together with the intermediate wall and their pilasters, up to the 38 feet 2 inch level, were laid up with cement mortar, one part cement and two parts of sharp sand, excepting the outside course of the outer wall, which was laid in soapstone finish mortar, of a dark red color. From this level (38 feet 2 inches) up to the commencement of the head (223 feet 2 inches) the outer wall was laid up with mortar consisting of two parts lime and one of cement. For laying up of the head from the 223 feet 2 inch level up to the point to receive the cast iron cap, one part of lime and one of cement was used, and for backing up underneath the cap after it had been thoroughly screwed together, three of sand and one of Portland cement was used. Special brick was used for the outside course at each of the corners of the octagon, which were moulded to shape in order to avoid cutting, and at the same time secure a better outside finish. The bond throughout the entire structure consisted of full headers for every six courses of brickwork. This method of construction was carried on up to the 66 feet 2 inch level, when work was suspended November 29th, for the season of 1889, and the top of the structure covered with matched boarding and tarred paper for the winter.

The chimney was built entirely from the inside platform, the masons working overhanded, and thus no staging was necessary on the outside.

Up to the level of the granite work all the stock used was carried up a ladder placed on the outside. But at this point there was constructed inside the 14-foot chimney flue an elevator, fitted with safety clutches, and capable of carrying 1,000 pounds, although not more than 450 pounds was allowed to be placed upon it at any one time; and thereafter everything used in the process of construction was sent up on the elevator, to hoist which a 19 strand steel cable was used. The temporary framework inside the flue consisted of four 6×8 timbers, laid across each other at right angles, in pairs, and built into the wall at intervals of every 5 feet. Through the opening at the center the elevator passed. Over these timbers was laid a platform of 2-inch plank, upon which the masons performed their work. To these 6×8 inch horizontal timbers, at opposite corners, were bolted the vertical guides for the elevator and the upright framing by which it was hoisted; these were spliced out at the top each alternate staging.

The opening for smoke flues is 10 feet wide and 18 feet high, with a 28 inch arch of 5 feet radius. The lower part of the opening is on the 14 feet 2 inch level. Directly below and above the opening on the 13 feet 2 inch and 33 feet 2 inch levels, were placed in each of the four sides of the chimney, and 8 inches from the outside surface of the wall, two 1¼-inch diameter tie-rods, with 1½ inch ends. These were all connected together by cast iron corner plates 12×14 inches square. Openings were left at each corner so that the nuts could be examined occasionally as the work dried out.

From and including the 53 feet 2-inch level, there were laid edgewise, at each 20 feet in height and 8 inches from the outside surface of the chimney, wrought iron bars of 4 inches × ½ inch, with their ends bolted together, forming an octagon corresponding to that of the chimney. At the 133 feet 2 inch and 153 feet 2 inch levels these braces were reduced in size to 3 inches × ½ inch, and were not again used until the 223 feet 2 inch level, or when the commencement of the head was reached, at which point bars 3 inches × ⅝ inch were bolted together in the wall. Their next application was in the head, where two braces made of 4 inches × ½ inch iron were used to assist in binding the heavy brickwork together during construction, which had considerable overhang (2 feet 9 inches on each side).

With reference to the outside wall, the outer and intermediate walls, with their connected pilasters, were built as one structure and terminated on the 83 feet 2 inch level, where by the batter of the outer wall it joined the intermediate and became one wall from that point. At this level two holes, 5 × 8 inches, were left in each of the eight sides of the intermediate wall, so that the intervening space between the outer and inner walls might be ventilated, if by any possible chance gases should find access to this space. These ventilating holes are in communication with the space between the outer wall and the core, which is carried nearly to the top.

As before stated, work was suspended November 29th, 1889, and on April 22d, 1890, work was again resumed, but on account of bad weather it was thought well to hurry the construction along somewhat, so that June 28th four arc lights, of 2,000 candle power, were placed upon the top of the elevator staging of the chimney for lighting at night, and a gang of masons relieved the day gang. This was continued until August 6th, 1890, when the night gang was dismissed, the chimney having then reached the height of 223 feet 2 inches. At this point the head of the structure was commenced, and gradually built up in cement mortar, as before stated, and measured when completed 24 feet across its sides;

and on the 10th day of March, 1891, a flag was hoisted on its top by the eight year old son of a member of the firm of the designing engineers in honor of its completion, and in celebration of the visit of the National Electric Light Association, whose President, Mr. Marsden J. Perry, is also General Manager and Vice-President of the Narragansett Electric Lighting Company.

On October 4th, 1890, all brickwork was completed up to the 253 feet 9 inch level, and ready to receive the cast iron cap, but on account of delays the ironwork was not received to place in position until January 28th, 1891. On February 11th, the first of the 25 pieces of the cast iron cap was hoisted to the top, and the work of bolting it together commenced. Copper bolts were used entirely for securing it together, these passed through flanges cast on the under side of the plate forming the cap. There were also on the outer surface upright flanges, one turning down over the other, and thus preventing water from penetrating the brick through the joints of the cap. All of the joints of the cap where there was a possibility of leakage were carefully filled in with sal ammoniac and iron borings, thoroughly rammed or calked in, and thus a perfectly tight and secure connection was obtained. The weight of the cap alone when in place was 22,000 pounds.

In order to facilitate ascending the chimney a ladder made of 1¼ round iron was built solidly into the outer wall at a point in its circumference where there was the greatest space between the intermediate and core walls; these bars were spaced 16 inches center to center, and as before stated, were built into the outer wall, while in the core wall their ends were merely inserted into a cavity, 2 inches wide and a course of brick high, so that any expansion of the inner core would not affect the solidity of the ladder. Ascending this ladder, provision is made for protection from the gases at the top by building across the corner a cast iron vertical plate, with its edges turned into the brickwork 8 inches and its lower end terminating at a point 3 feet below the top of the core wall, thus forming a chamber; and from this, by means of a hatchway in the cap, also provided with ventilating openings in its side, access to the outside of the cap is readily had. Since the completion of the chimney this ladder has been used several times, not from necessity, but for the novelty of the deed on the part of workmen.

An attempt has been made to protect the structure from lightning by encircling the cast iron cap with a copper ribbon $1 \times \frac{3}{16}$ inch thick, to which are connected by a riveted and soldered joint, eight brass upright sockets, one in the center of each panel of the cap. To these brass socket castings are secured by soldered joint, 1¼-inch seamless drawn copper tubing which extends upward above the top of the cap and conforms to its shape. After projecting 5 feet above the upper portion of the cap the tubes are each surmounted by a brass casting 28 inches long, tapering in cross section and having at its extremity a platinum point 1½ inches long. The encircling ribbon around the cap is connected with the ground ribbon by a brass casting thoroughly riveted and soldered thereto. As it runs down the chimney this ground ribbon is secured in position by brass clamps with bolts which were built into the brickwork as it progressed. The lower end of the ribbon, which is $1 \times \frac{3}{16}$ inch copper, rolled in one piece 285 feet long, terminates in a copper plate 30 inches wide by 60 inches long and $\frac{1}{16}$-inch thick, and is buried 4 feet below the natural level of the water in the soil of the premises. This plate is buried in a load of powdered coke, 18 inches being placed above and 18 inches in thickness below the plate, and the whole filled up with gravel.

After completion, the outside of the chimney was thoroughly oiled, in order to bring the brickwork to one uniform color.

The amount of material used in the course of construction above the concrete foundation is as follows: Brick, 1,332,921; lime, 695 casks; F. O. N. cement, 1,025 casks; Portland cement, 17 casks; soapstone coloring, 99 casks; sand, 3,858 casks; cast iron cap, 22,000 pounds; cast and wrought iron, 7,215 pounds; copper bolts, 250 pounds; lightning rod and brass castings, 326 pounds.

Important to Coal Men.

The United States Circuit Court for the Middle District of Tennessee held, in the recent case of the United States vs. Jellico Mountain Coal and Coke Company, reported in the *Railway and Corporation Law Journal*, that an agreement between coal mining companies operating chiefly in one State and dealers in coal in a city in another State, creating a coal exchange to advance the interests of the coal business, to treat all parties to the business in a fair and equitable manner, and to establish the price of coal, and change the same from time to time, by which it was agreed that the price of the coal at the mines should be 4½ cents, the freight being 4 cents, and the margin of the dealer should be 4½ cents, making the price to the consumer 13 cents, and that whenever the price of coal was advanced beyond an advance in freights one-half the advance should go to the mine owner and the other half to the dealer, and a penalty was provided by fine of any member selling coal at a less price than the price fixed by the exchange, and by which it was forbidden for owners or operators of mines to sell coal to any person other than members of the organization, and for dealers to purchase of miners who were not members, but exempting coal used for manufacturing and steamboat purposes from the prices prescribed until all the mines tributary to that market should come into the exchange, or until the exchange could control the prices of coal used by manufacturers, was within the language of act of Congress, July 2, 1890, declaring "every contract or combination in the form of a trust or otherwise, or conspiracy in restraint of trade or commerce among the several States," and also the monopolizing, or combination with another to monopolize trade or commerce among the several States, a misdemeanor.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We are indebted to a correspondent, who writes under date of the first inst., from Rockford, Ills., for the information that the affairs of the Van Wie Gas Stove Company, the failure of which Company was formerly reported in the JOURNAL, have been readjusted, and that the business will be carried on in the same city. The arrangement was effected on September 29th, and under it the trustees—Messrs. James Barnett, B. L. Rouse, H. C. Kirby and A. Carlin, of Cleveland, Ohio, and W. A. Merrifield, Secretary and Treasurer of the Stover Manufacturing Company, of Freeport, Ills.—buy the entire plant for $43,554.14, which sum represents the total indebtedness of the concern and cancels all liens against it. Mr. George D. Roper visited Cleveland on September 6th, made a statement to the stockholders there, who came to an understanding that the present plan adopted was the very best one to bring about a prompt adjustment of difficulties. A stockholders' meeting was called and an option given to the gentlemen above named, who are understood to be acting for a syndicate composed of the largest creditors of the Company. Although handicapped in many ways during the past six months, large orders have been filled and the business of the concern has not been such as to discourage those familiar with the inside workings and future possibilities of the enterprise, and it is considered that the present arrangement puts the Company in a safe financial position. Mr. E. C. Warren, Superintendent of the works, has been placed in temporary charge, but it is likely that Mr. George D. Roper will shortly be appointed General Manager.

At the annual meeting of the shareholders in the Tonawanda (N. Y.) Gas Light Company, a large representation of the stock was had. The annual report of the Manager (Mr. H. M. Stocum) showed a healthy increase of business for the year. Seventy new consumers were taken on the lines, and 100 street lamps were also contracted for by the authorities. The increase in output for the twelvemonth was 6.5 millions cubic feet, which gain is remarkable in that it was made in the face of a newly established electric lighting company. The Directors chosen were Messrs. James H. DeGraff, Chris. Schwinger, A. H. Crown, A. C. Campbell, A. G. Kent, L. G. Stanley and Wm. Dick. The Directors subsequently perfected the following organization: President, J. H. DeGraff; Vice-President, A. G. Kent; Secretary, A. H. Crown; Treasurer, L. G. Stanley; Manager, H. M. Stocum; Supterintendent, T. Hunt.

The Citizens Gas Company, of Paw Paw, Ills., has been incorporated by Messrs. B. F. Frantz, W. H. Edwards and others.

The authorities of Flatbush, N. Y., are making some improvements on the handsome main street of the village—Flatbush avenue—and the improvements necessitate a re-adjustment of the gas lamps and posts. The Gas Company, however, does not object, as the authorities have decided that the lamp posts are hereafter to be only 150 feet apart, instead of 200 feet, as before.

In connection with that gas main extension from the works of the Newark (N. J.) Gas Light Company to points west of the city limits, the following is given as the reason therefor. "The Montclair Gas and Water Company is now carrying out its intention, formed many years ago, and is extending its main pipes from Bloomfield in order to supply any consumers who may desire to use gas in Belleville. The Montclair Company bought and intended to erect a gasholder in Belleville in 1872, in accordance with the rights then given it by the Legislature. This gasholder has since been stored at the works of the Company, as the

panic of 1873 and the consequent depression made it inadvisable to proceed with the work. These conditions have now changed, and an examination indicated there were enough consumers to warrant laying down pipes for the supply, and a careful canvass will be made to determine where they are most desired. The Montclair Company also expects to connect its pipes with those of the Companies in Newark, which extend to the city line, and obtain temporarily from this source any gas it may require, it being probable that the works of the Montclair Company will be removed to a location on the Passaic at Belleville. The gas from Newark, in accordance with an agreement with the Citizens Gas Light Company, will for the present be supplied by the Newark Gas Light Company, as the latter Company has a manufacturing capacity greater than its present needs."

THE following rates for a supply of natural gas were put in force by the Indianapolis (Ind.) Natural Gas Company on the 1st inst. :

	Per Month.	Per Year.
Ordinary tips	$0.25	$3.00
Jumbo tips	.40	4.80
Argand burners	.40	4.80
Welsbach burners	.40	4.80
Victory, or small sunflower burners	.40	4.80
Large sunflower burners	.60	7.20
Lungren lamps, using 8 feet per hour	.75	9.00
" " " 12 " "	1.00	12.00
" " " 16 " "	1.25	15.00

This is equivalent to an increase, on the average, of 50 per cent.

MR. JOHN R. NOWLAND, who last month resigned from the service of the Philadelphia, Wilmington and Baltimore Railroad, at Chester, Pa., to accept the Superintendency of the Delaware County Gas Company, will return to the Railroad Company service again, the Railroad folks having made him an offer that he could not refuse. He retires from the Gas Company to-morrow.

MUNCIE (Ind.) will install an electric lighting plant to be operated on municipal account, a majority of the voters having so decided. The plant is to cost $30,000

THE Canadian Electrical Association has been organized at Toronto, the initial meeting having been held about a fortnight ago at the offices of the Toronto Electric Light Company. The objects of the Society are "To foster and encourage the science of electricity and to promote the interests of those engaged in any electrical enterprise." A general meeting will be held in Toronto, on November 26th, at which gathering a draft of a constitution for the government of the Society is to be submitted.

WHEN the time came for making a new contract for a supply of natural gas fuel to the Indiana State House, for the ensuing year, the Indianapolis Natural Gas Company insisted that it could not carry out the service for less than $7,500. City Engineer Cain declared that that figure was altogether too high, and asserted that he would alter the furnaces for the consumption of crude oil. Meanwhile, however, the Company and the Engineer "came together again," the Company agreeing at the second conference to furnish all the gas necessary for the sum of $5,300 per annum. This was satisfactory to Engineer Cain, and a contract has been entered into at the reduced figure.

THE many friends of Mr. Thomas R. Cooper, Electrician to the Woonsocket, R. I., Gas Company, will sympathize with him over the death of his wife. Mrs. Cooper, who was in her 24th year, succumbed to an attack of typhoid fever.

THE Woburn (Mass.) Gas Light Company has declared a semi-annual dividend of 4 per cent.

THE premises, No. 52 Lake street, Chicago, Ills., which were jointly occupied by the National Gas Light and Fuel Company, and the Globe Light and Heat Company, were the scene of a brisk fire, which broke out on the morning of the 2d inst. The well-directed efforts of the fire department soon had the flames in check, but the building and its contents were deluged with water. The Globe Company's loss on materials used in the manufacture of its specialties—lamp posts, chandeliers, reflectors, lanterns and gas machines—was quite heavy. The National Company lost some office furniture, but Manager Shelton was ready for business almost as soon as the firemen had taken their hose out of the building. The fire started in the basement, at the foot of the elevator shaft, and is said to have been caused by the carelessness of some laborers who were mixing paint. The Globe Company has secured temporary headquarters elsewhere, but Mr. Shelton can be communicated with at the old stand.

IT is reported that Peabody, Mass., will install an arc lighting plant and operate the same on municipal account, the residents having complied with the preliminary steps made necessary by the provisions of the State Act authorizing such procedure. It is estimated that 120 arcs, of 2,000 candle power each, will be equal to the task of lighting the town.

THE Mayor of Fort Worth, Texas (Mr. J. P. Smith) will receive, up to 3 P.M. of the 19th inst., bids for all the necessary work and material for the construction of a new water works for that city. Among other materials specified, the following quantities of cast iron pipe are called for :

Weight.	Diameter.	Lbs. Per Foot
60 tons	4 inch	24
1,747 "	6 "	33
2,485 "	8 "	50
1,022 "	10 "	65
1,051 "	12 "	82
211 "	16 "	130
6 "	16 "	105
1,089 "	18 "	167
175 "	24 "	250
663 "	30 "	340
262 "	36 "	410
120 "	48 "	600
237 " of specials.		

THE State Board of Gas and Electric Light Commissioners recently visited Marlboro, Mass., and inspected the works. The verdict was that the plant was up to every requirement of the city.

THE people of Paterson, N. J., are making an outcry over the poor quality of the lighting service given them in their streets by the Edison Electric Illuminating Company.

A RECENT issue of the Boston, Mass., *Beacon*, in referring to the Bay State Gas Company's financial condition, says : "The recent gains in Bay State gas securieties have brought this Company once more into prominence. The advance of about five points in the first mortage bonds seems to have been due to legitimate investment orders. Nothing new has transpired in regard to the Company to account for an upward movement in its securities. The Addicks element in the management still acts as a weight upon both the bonds and the stock. The recent advance is simply attributed to the fact that as everything else was booked for a rise, a few persons thought there was also a profit in buying gas securities. On their merits the firsts are still regarded as among the cheapest things on the list, and it is confidently asserted by some of the most conservative bankers in town that were it not for the character of the management they would easily sell at par. Parties who have been identified with the firsts for a long time tell us that even at the improved quotations the bonds are a purchase. It is hard to see how the management can do anything hostile to the interests of the holders of the firsts. The indenture provides that if the Company sells any of its property, the proceeds shall be put into these bonds which can be called at 105. There is, therefore, a chance that holders may realize this figure for their bonds. The chance we understand is a good one, as the Company contemplates the sale of its North End property. Its works at the Cow Pasture are not large enough to allow of an immediate sale of the Commercial street property, but it is expected that within a year, or at the most two years, the Company's facilities will be such as to allow the latter to be disposed of. The property is taxed for $1,000,000, and is undoubtedly a very valuable possession, not the least valuable part of it being the superior wharf facilities. As regards Bay State gas stock, there has not been any change in the programme of the management. The Company is earning handsomely and is steadily refusing to pay its stockholders anything. It is intimated, however, by parties who stand near the inside that within the next two or three months dividends will be forthcoming. The latest reason advanced by the management to too curious inquirers for not making a payment is that they are anxious to acquire a fighting fund of $600,000 to $700,000 before paying any dividend, and this reserve they expect to acquire before January 1. It will undoubtedly be gratifying to weary stockholders to know that even at that comparatively remote day their patience may be rewarded. But the fact of a fighting fund of such magnitude is calculated to arouse suspicions in timid minds. The management evidently expect an evil day. Can it be that they suspect that public opinion will be too much for them in the end and that in return for their high-handed policy they

will be obliged to surrender some of the privileges now enjoyed by them?"

COLONEL A. M. JOHNSON and associates propose to organize a Gas and Electric Lighting Company at St. Elmo, Tenn., with the likelihood that when the franchise is obtained the gas works portion of the enterprise will be first taken up. This place adjoins Lookout Mountain, in Hamilton county, Tenn., and both are about 3½ miles from Chattanooga. Together they should afford a district that would give a profitable field for a gas company.

IN our last we printed the figures submitted by the Milwaukee Gas Light Company in response to an invitation by the authorities to bid on the public lighting. The bids were on the basis of contract terms for one, three and five years, and on an hourly gas consumption of 5 and 6 cubic feet. The 5-year bid was: Gas to public buildings, 80 cents per 1,000 cubic feet; street lamps with 5-foot burners, $22.26 each per annum; with 6-foot burners, $25.31. The Street Light Committee conveyed an intimation to the Gas Company that it would recommend to Councils the acceptance of the 5-year contract if the Company would agree to cut the lamp rates to $22 and $25 per annum, respectively. The Company agreed to this, and the committee presented a report in accordance with its promise.

MR. THOMAS ROYCRAFT, Superintendent of the Grand Forks (N. D.) Gas and Electric Company, writing under date of October 4th, says:

To the Editor AMERICAN GAS LIGHT JOURNAL: It might interest you to know that we have just completed the extension of our mains, across the Red River of the North, from this city to the thriving little city of East Grand Forks, and are adding consumers very rapidly on the new extension. The river at this point is 200 feet wide and 13 feet deep in the center of the stream. We laid our main in the bed of the river, without the aid of a diver, and accomplished our object in the following manner: A drawbridge crosses the river at this point. We placed a boiler iron shell or manhole, 3 feet in diameter and 22 feet deep, inside of the bridge fender, equipping the shell with an iron ladder fastened to the inside, stuffing box joints, on both sides, being placed 2 feet from bottom. We excavated for this 2 feet below the level of our pipe line, thus giving us a chamber, 2 feet by 3 feet, for condensation. The manhole extends 7 feet above the present stage of water, and is provided with a drip pump. This in place, we dredged a ditch on a uniform grade from the openings on sides to shores. On both sides we used an 8-inch, flanged, cast iron pipe, and connected in one section from manhole to shore, 100 feet, and lowered to place, by screws attached to each joint. At the proper point it entered the stuffing box on the side of manhole, which had a clearance of one-eighth inch on outside of pipe stuffing boxes on inside of manhole. This done we attached a steam pump, of ample capacity, and pumped the water out of manhole and kept it out until stuffing box joints were made and glands tightened up, when our main was ready to connect at both ends with the mains we had already laid to the river banks. I think we are entitled to the origination of this method ourselves, for I certainly never heard of the method having been tried by any one else. It works very nicely. I did not deem it necessary to embarrass you with details about staging, etc.

MR. L. G. MCCAULEY, Treasurer of the National Heat and Power Company, Phil., Pa., writes us that the West Chester (Pa.) Gas Company has adopted the system of gas making, the patents for which are controlled by the National Company. The plant ordered by the West Chester Company will be put in at once.

THE plant of the Radford Pipe and Foundry Company at Radford, Va., will be in readiness to deliver cast iron pipe by November 15th. The capacity of the works is put at 150 tons per day.

THE Keene (N. H.) Gas Company's mains have been fitted with gates at all the leading points in the system.

THE Mullins-Edey leasehold of the Fishkill (N. Y.) Gas Company's plant cannot be said to have brought unbounded fame to them. The people complain of the gas service and the operators refuse to better it.

A CORRESPONDENT at St. Paul, writing under date of the 3d inst., says: "Superintendent Myers, of the St. Cloud (Minn.) Reformatory, was in the city last evening accompanied by Messrs. H. G. Keith, John Cooper, and Fred. S. Pillsbury, members of the Board of Managers of the St. Cloud Reformatory. The latter gentlemen have been in St. Cloud visiting the Reformatory, which they state is in good condition. Yesterday they met in the Mayor's office for the purpose of letting a contract for an electric light plant at the Reformatory, which is a State institution, and I am of the opinion that they are far from that united frame of mind over the bids submitted, in respect to picking out therefrom one that would give the State the best results in the final matter of illuminating the Reformatory buildings. At any rate a committee of the Board of Managers, composed of Messrs. Fred S. Pillsbury, John Cooper, H. I. Griswold, Judge Kieth, J. W. Stevens, and Supt. D. E. Meyers, met the night before last at the Merchants Hotel to hear each bidder for the contract to furnish the electrict light plant at the Reformatory expatiate upon the superior qualities of his system. For nearly three hours the Committee sat and listened to lengthy harangues about dynamos, insulated wires, engines, incandescent and arc lights, etc. They also heard why each system is better than any other, but it was hard to tell which man did represent the best system when they all claimed that distinction. The matter will be settled before the 15th inst."

WE have received a copy of the first annual report of the operations of the Tien-Tsin Gas Company, Province of Pe-Chee-Lee, China, which goes to show that a city boasting of one or two millions (a million or so does not seem to make much difference when "counting up" the population of a Chinese or an Indian center of population) of people may not be a good place wherein to locate a gas company. In any event, Mr. W. W. Dickinson (President of the Company) reports that the capital invested in the undertaking—almost solely subscribed by foreign residents of Tien-Tsin—is $25,000, and that the sum to be charged to the right side of the profit and loss account, on the operation for the twelvemonth, is a trifle less than $550. So far the gas mains extend only through the business and residence quarters, which one may well imagine are not very widely separated, of the "foreign population, which is chiefly composed of English and Americans; but it is the intention of the proprietors to push on to the Chinese "quarters," which likely may not be far from $\frac{2}{3}$ of the city. However, if the resident Chinaman does not patronize the Gas Company in his home, the city is a much larger patron of the art, in that the total quantity of gas made was 1,540,911 cubic feet, public lights absorbing 893,383 cubic feet, while the consumption on private account amounted to 537,616 cubic feet, unaccounted-for gas, therefore, showing at 103,912 cu. ft. The average gas rate seems to be $4.58 per 1,000. The Superintendent's report, among other things, contains the following details respecting the process in use, etc.: "Dr. Hirzell's process is in use, the Doctor guaranteeing certain results, about like these: 1st, the average duration of a retort to be 120 days, with an hourly production of from 300 to 400 cu. ft of gas; 2d, 100 lbs. of refined kerosene oil to yield 953.5 cu. ft. of gas; 3d, that a burner consuming 1.5 cu. ft. of gas per hour would have a minimum lighting power of 12 candles; 4th, 380 lbs. of coal would evaporate 100 lbs of oil." Supt. Poulsen finds that the retorts last on an average 120 days, that the hourly gas production is 340 cu. ft.; that 1.080 cu. ft. of gas is produced from 100 lbs. of oil—tests were made with Batoum oil but the final verdict was that the American brand of "Devoe" oil was much the best; that burners varying from 1.54 to 2.1 cu. ft. consumption per hour yield a light of from 16 to 22 candles—all the burners and globes have been adapted for oil gas; and that 145 lbs. of No. 5, Seam Lump, Kai-ping coal were required to "evaporate" 100 lbs. of oil. Continuing, Mr. Poulsen says: "From the oil we get 20 per cent. of creosote tar, which is sold and used for painting and preserving wood, the price obtained being ten cents per gallon. About 33 per cent. of the coal is converted into coke. The total length of mains is about 6,000 yards, and the Chinese laborers are getting quite proficient in their duties. Gas is made every second day, and with one retort only. We have lately supplied it for 154 public lamps, and about 980 private burners. In spite of difficulties caused by water and fire the gas has been continuously supplied." According to the revenue account, kerosene oil for gas manufacture cost $3,672.53; coal, $542.18; and salaries, wages, etc., $1,447.32. An amusing feature of the revenue account is that which shows an expenditure of $50 for rent, while $77.15 were expended for the services of an agent in soliciting subscribers.

ONE of the most attractive features at the Mechanics' Fair Exhibition in San Francisco was the display of gas stoves made at the instance and expense of the San Francisco Gas Light Company. The Company's gas stove was awarded a diploma, and it is not at all unreasonable to say that a further and more remunerative reward will come to the Company in the shape of a largely increased day sendout as the result of its exhibit at the Fair mentioned.

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AGENTS.

NEW YORK.—AMERICAN NEWS CO., 39 and 41 Chambers Street
Germany.—B. WESTERMANN & CO., of New York.

MONDAY, OCTOBER 12, 1891.

The Market for Gas Securities.

During the week the market for city gas shares was dull and inactive, the opening quotations for Consolidated to day (Friday) being identical with that reported in the JOURNAL for last Friday. There is, as hitherto remarked in this column, but a trifling amount of floating stock in the street, and we doubt very much if an order for 500 shares could be filled without putting the quotations well above par. There is some talk again of a probable increase in the dividend rate, but we are of the opinion, judging from the conservative financial policy followed so far by those in control, that no change will occur this half. It would not be good policy, to say the least, to increase the dividend in the face of the coming of a legislature, some of the members that held over in which have hitherto said that New York ought to have dollar gas—or that they should "get their price." It will cause less comment next June, when the legislators have ceased from their labors (?) and strikes. Equitable and Mutual are dull and strong, and well-informed dealers in these shares hold the opinion that 128 to 130 about marks their real present value.

The Standard Company is suffering from persecution at the hands of some Harlem malcontents, whose crusade is based on the charge that the system of manufacture followed results in injury to their health and in damage to their property. The truth is that the works are well conducted and that the odors which so offend the nostrils of the unkempt complainants are not "in the smell" with some of those that constantly emanate from the tenement rookeries of upper 115th street, rookeries that are owned by some of the people most prominent in the agitation. The preferred stock of the Standard was this week bid for at 82, while the common was also inquired after at 40 to 45.

Over in Brooklyn the situation is unchanged, prices holding fairly well at last quotations. The consolidation of the Union and Citizens Companies was ratified by the shareholders on Tuesday last, and, although we are unable to give the full details at present, those that we are in possession of seemingly show the Citizens Company to have the better of the consolidation. The Union Company's district is growing with amazing rapidity, and it is bound to be very valuable territory for gas consumption.

In out-of town shares we note an advance in Bay State gas. Jersey City gas is strong at 182 to 190. Laclede gas, which Company is going ahead under Col. Stedman's clever guidance, is quoted at 19 to 20, and there is a better demand for the bonds. Chicago gas is strong, and holders predict that 55 will be made in it before November first.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

OCTOBER 12.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	98½	99
Central	500,000	50	—	90
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	119	121
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	119	121
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	40	45
Preferred	5,000,000	100	—	82
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	100
Citizens	1,200,000	20	88	90
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	112	115
" Bonds	300,000		100	105
Peoples	1,000,000	10	60	65
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	90	95
" Bonds (5's)	70,000	—	—	—
Nassau	1,000,000	25	125	—
" Ctfs	700,000	1000	98	100
Williamsburgh	1,000,000	50	100	—
" Bonds	1,000,000	—	105	109
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	—	84½
2d " " "	3,000,000	1000	70	—
Bay State Gas Co.—				
Stock	5,000,000	50	—	56
Income Bonds	2,000,000	1000	98	102
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds.	45,000	—	—	—
Chicago Gas Company.	25,000,000	100	52½	52¾
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	83	83⅞
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	—	100½
Consumers Toronto	1,000,000	50	169	172
Central, S. F., Cal.			90	—
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	45½	45¾
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn.	750,000	25	109	114
Jersey City	750,000	20	181	183
Louisville, Ky.	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	19	20
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	77½	77¾
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds.	240,000	100	103	—
New Haven, Conn.		25	200	—
Oakland, Cal.			34¾	35¼
Peoples, Jersey City		—	115	125
" " Bonds.			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	99	100
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	63	63½
Washington, D. C.	2,000,000	20	200	208
Wilmington, Del.		50	88	90

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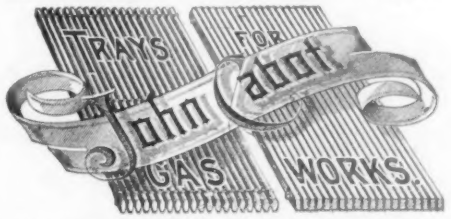

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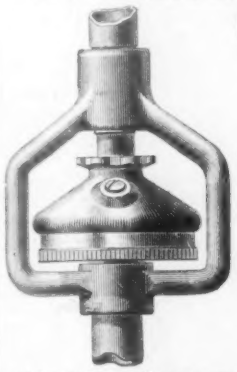

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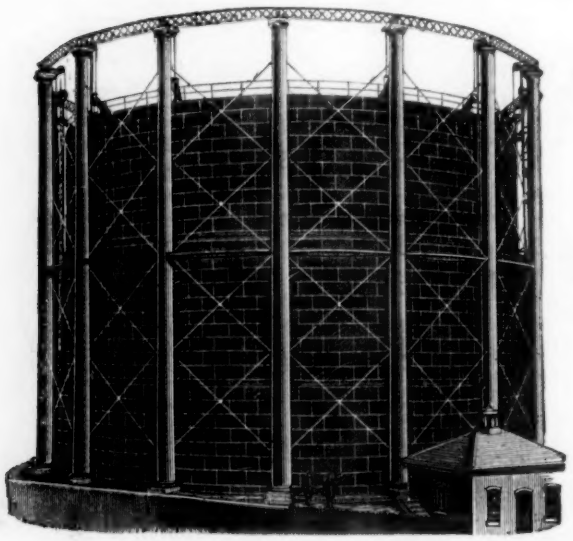

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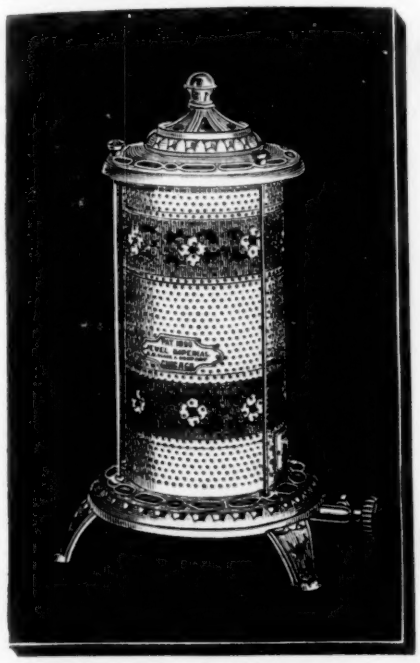

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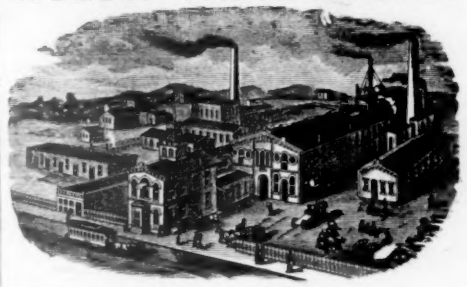

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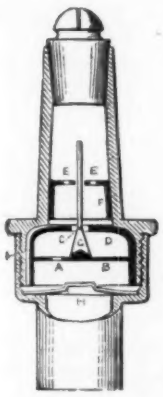

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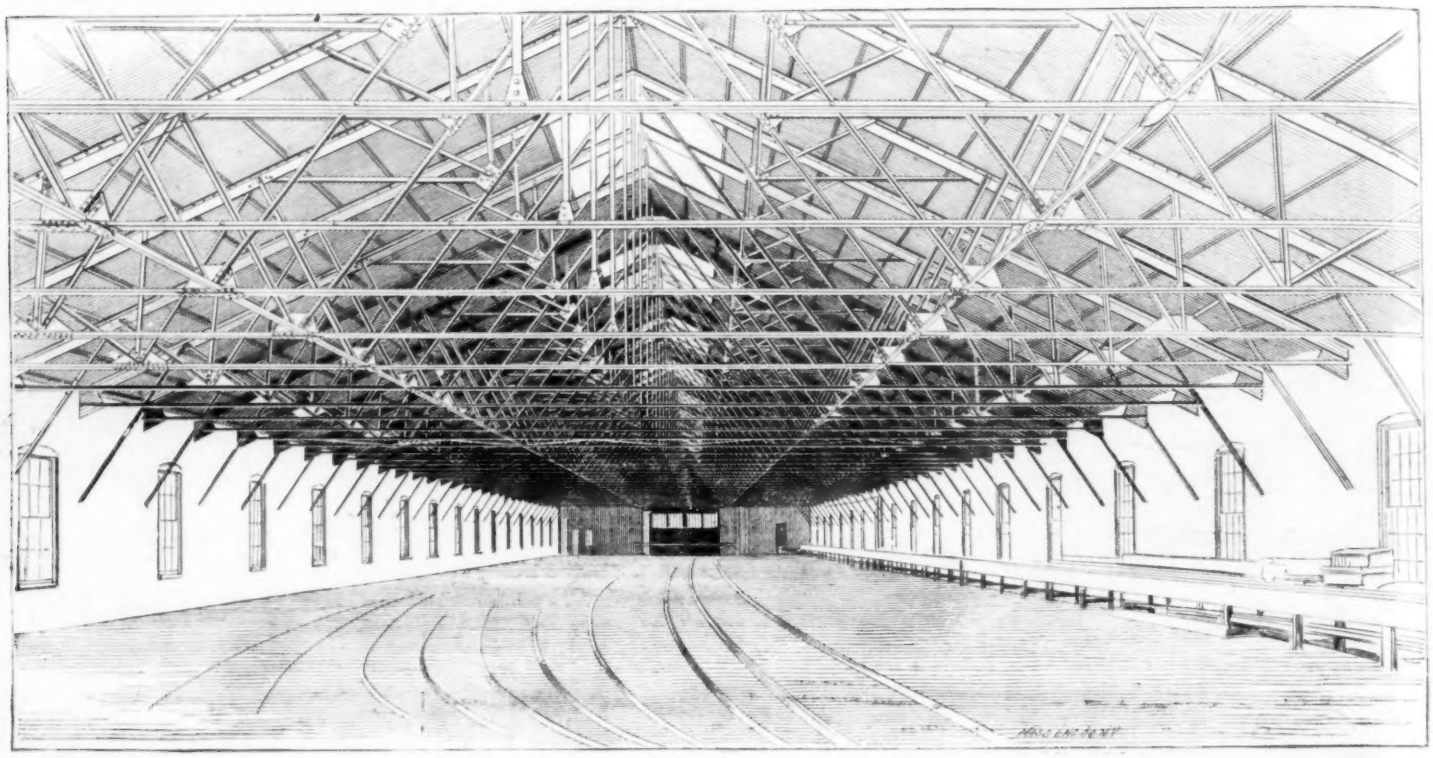

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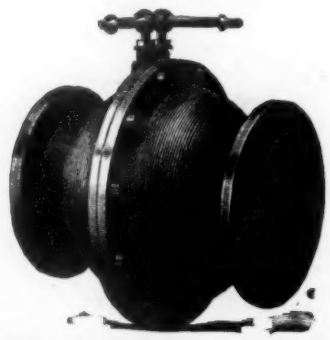

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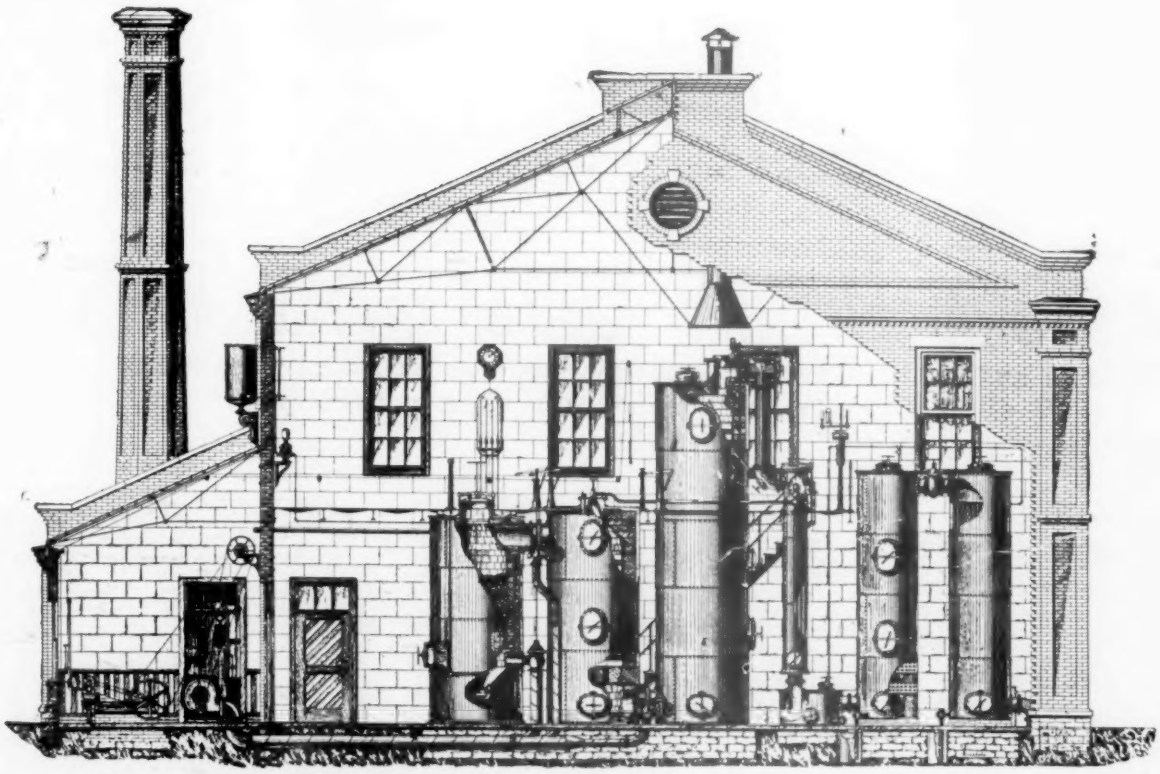

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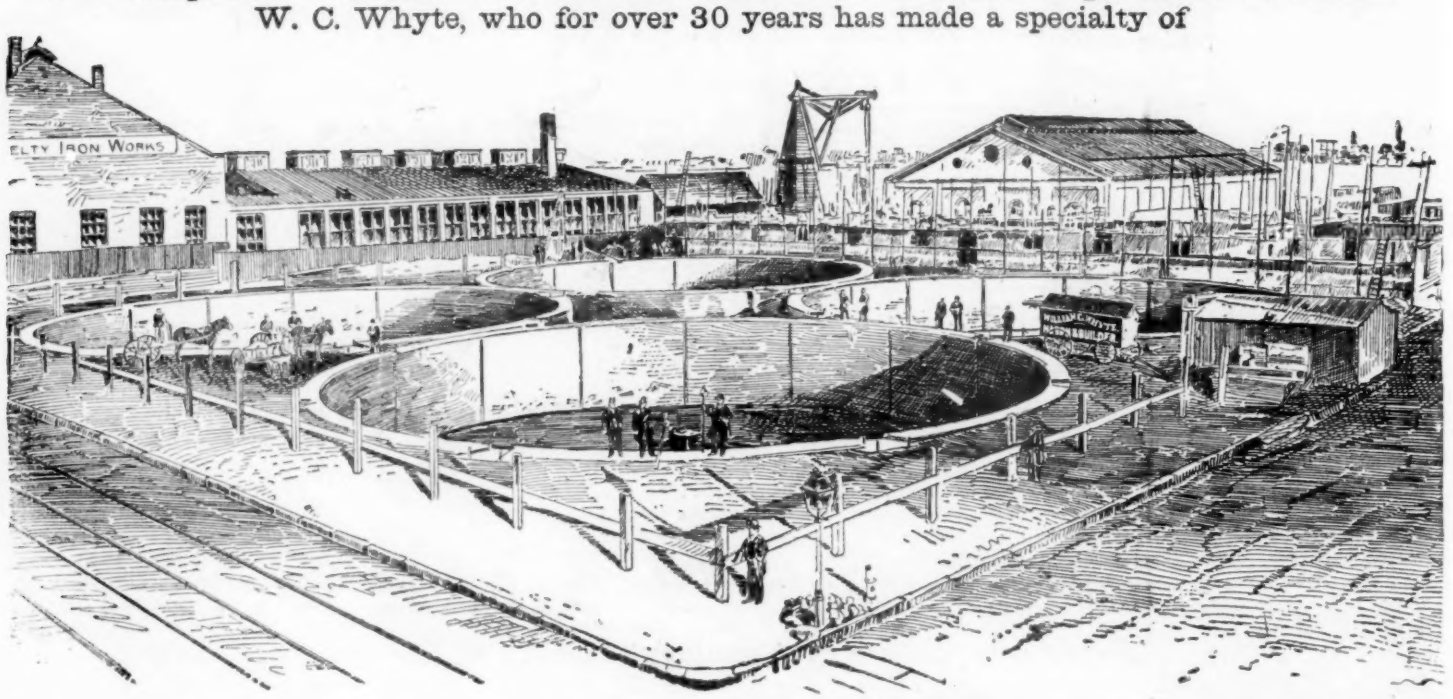

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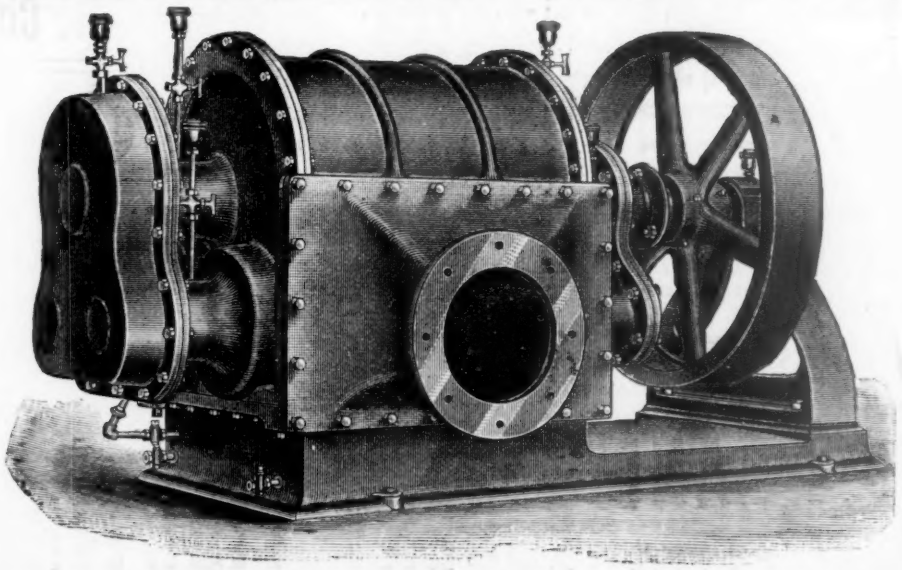

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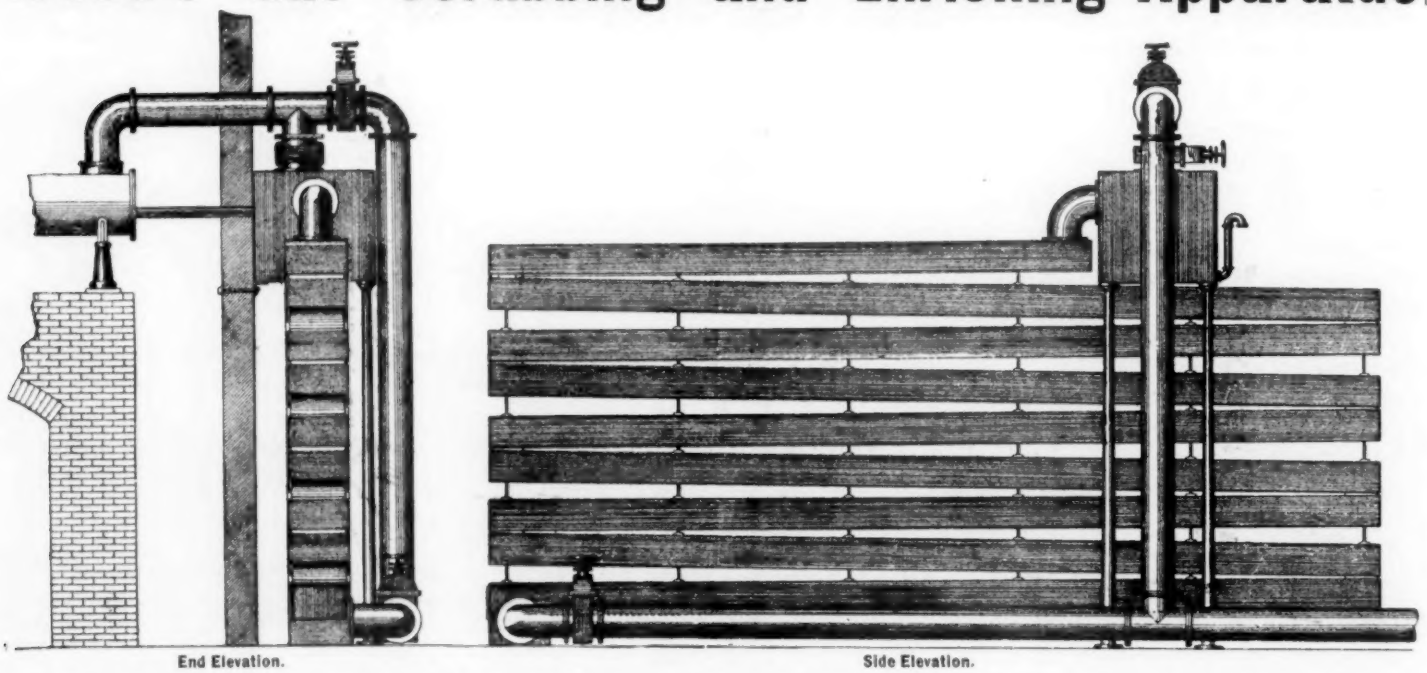

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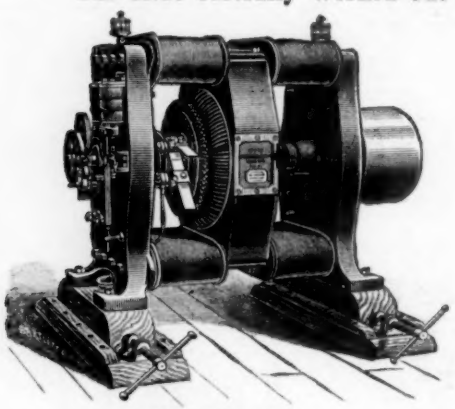

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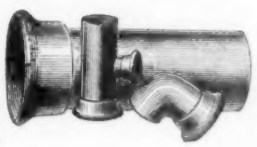

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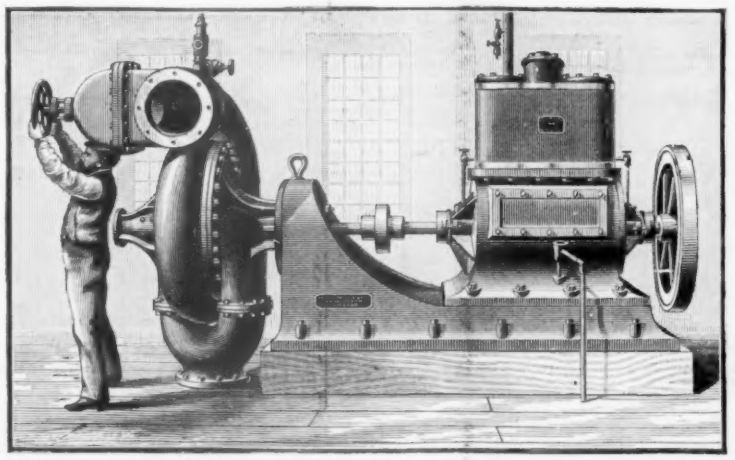

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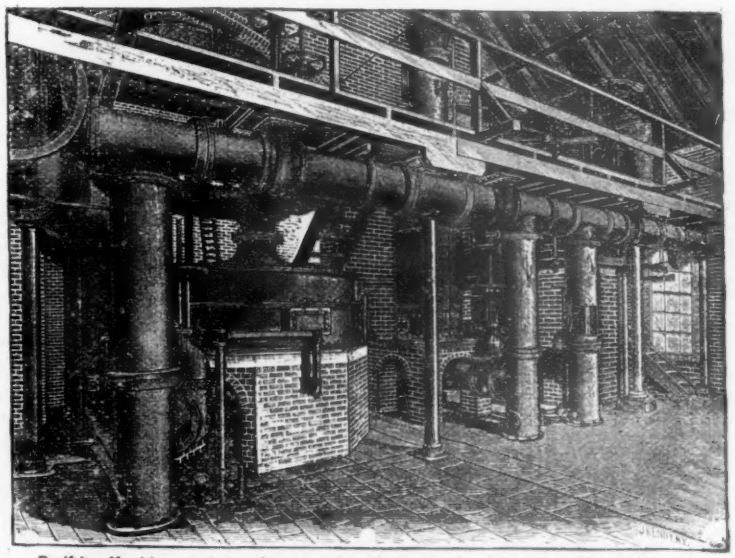

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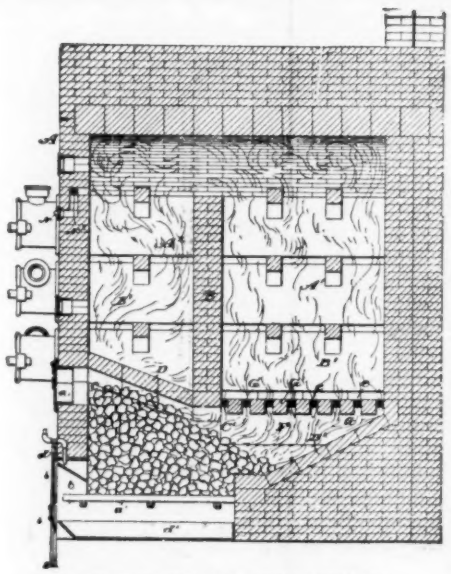

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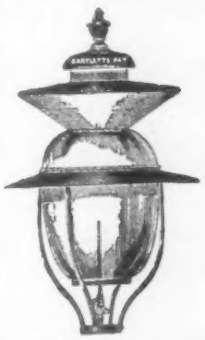

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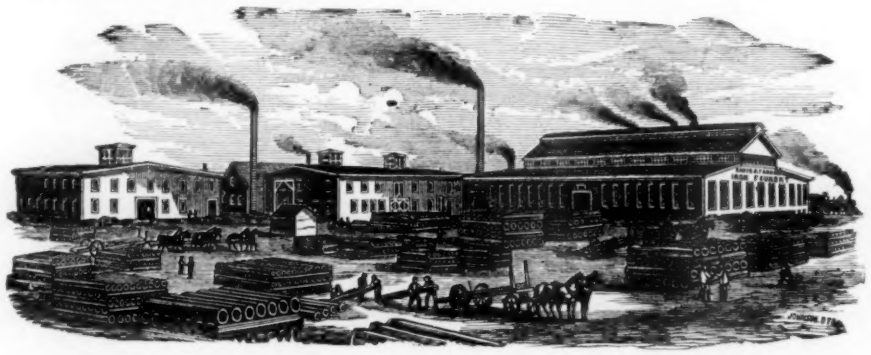

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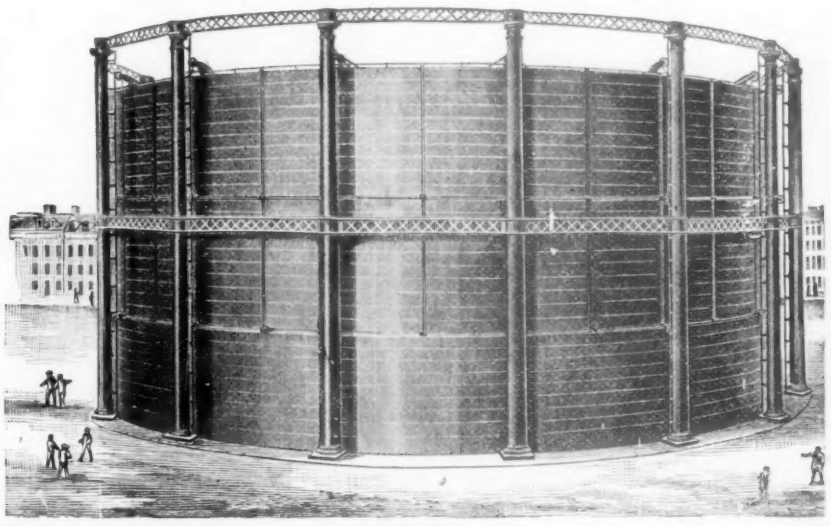

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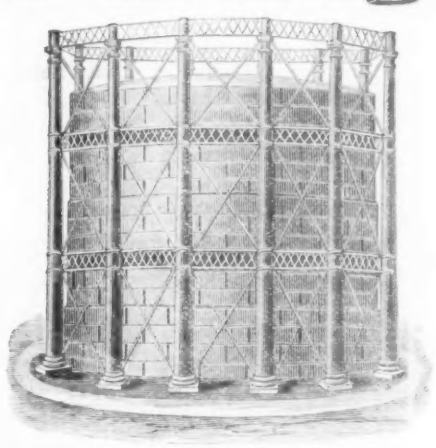

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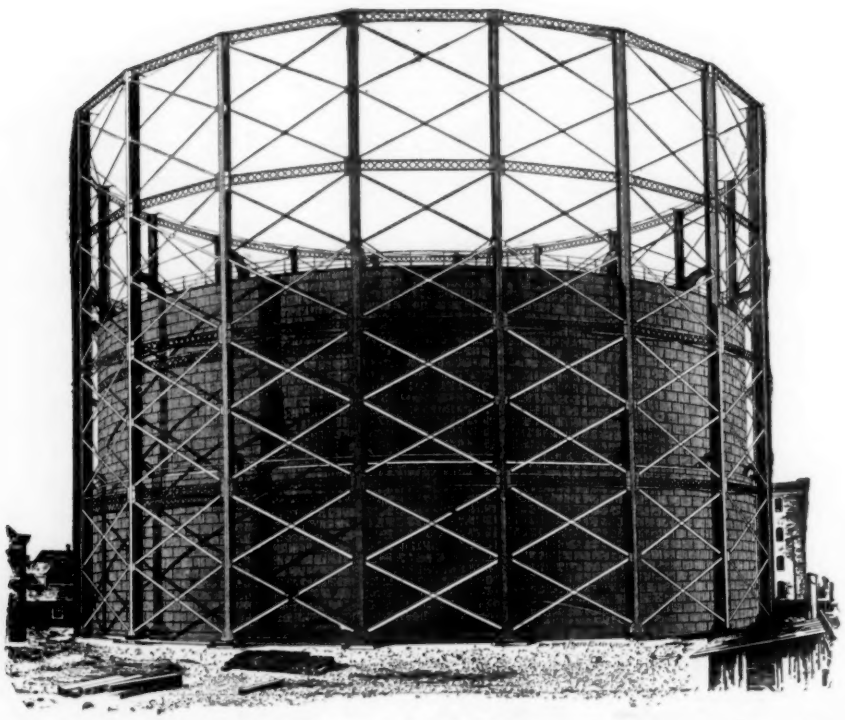

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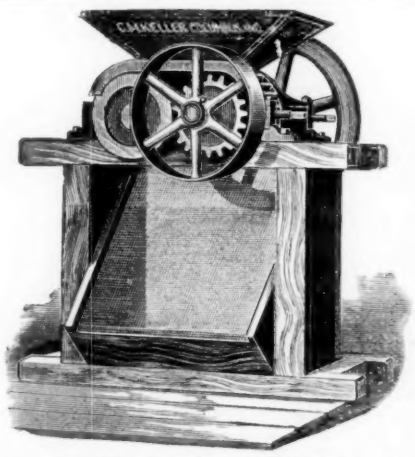

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